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#289

## INDUSTRY

### THE RISE OF UNREAL

The history and future  
of the real-time engine

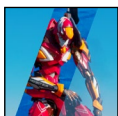


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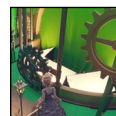
### VFX MASTERCLASS

Pro tips from visual effects compositing  
master and Nuke guru, Victor Perez



### TIKTOK 3D

How to make animated  
social content with Blender



### REAL-TIME

Celebrating a decade of  
innovation with Ncam



DISCOVER THE LATEST  
3D PRINTING TECH

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REALITY  
PIPELINE GUIDE

LUMION 12 AND  
MODO 16 TESTED

BUILD A DETAILED  
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FUTURE  
ISSUE 289



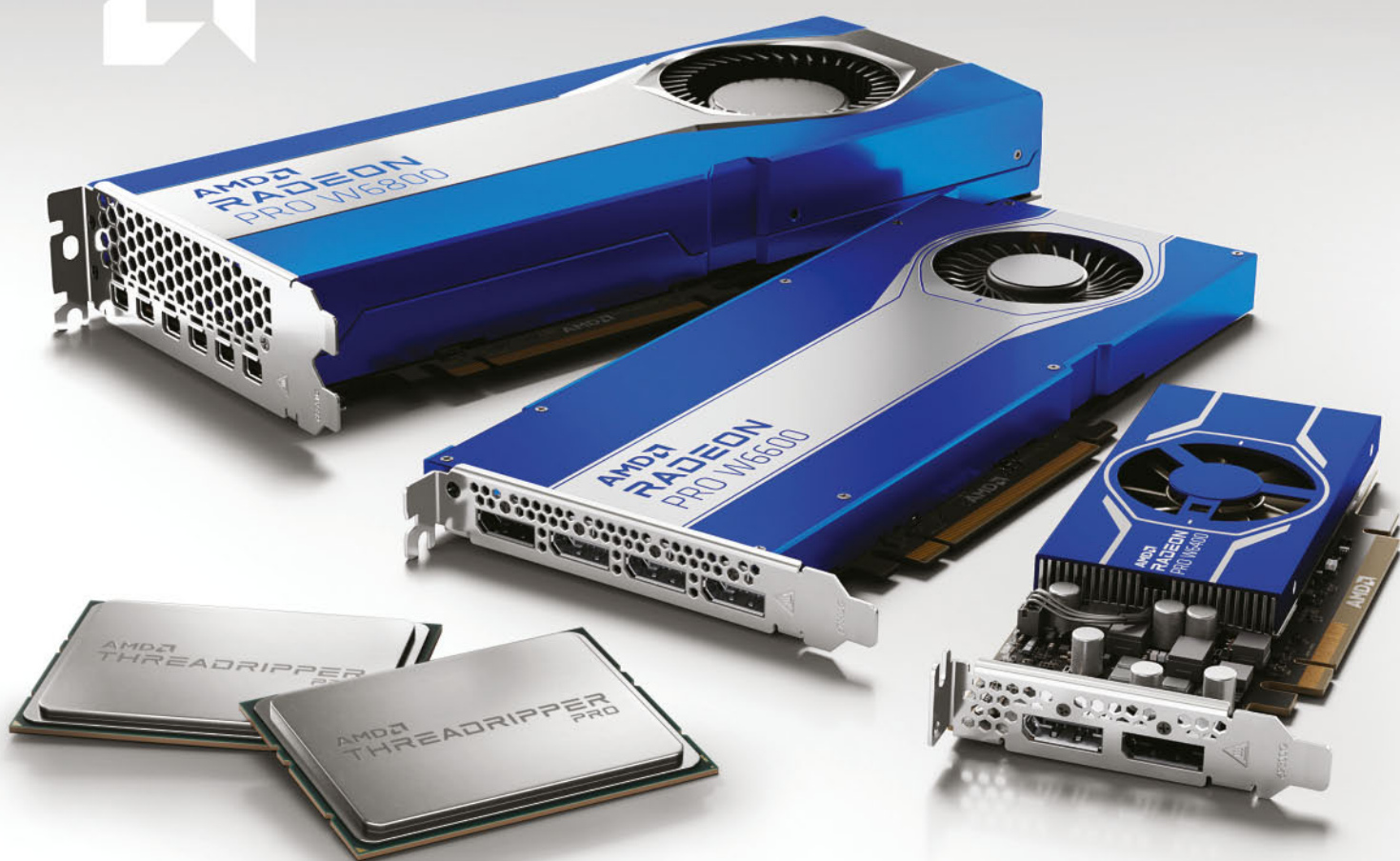
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COVER ARTIST  
Eidan Elgrably  
SOFTWARE  
Maya

# WELCOME

This month our cover features the wonderful Ana Kaona by Eidan Elgrably. The modelling is fantastic of course, but it is the lighting that really makes it – so Eidan shares his top tips for lighting a character using Autodesk Maya.

We also take a good look at some of the latest tech advances in this issue. We investigate how 3D printing is helping movie props makers and set design, explore Ncam's real-time tools, and review the latest versions of Modo, Lumion, Phoenix, and Wacom's Cintiq Pro 16.

If you're looking to use your skills in new ways, check out how to use Blender for TikTok,

or learn how to make use of cheap cameras for your own VFX projects.

Rob

Rob Redman, Editor  
[rob.redman@futurenet.com](mailto:rob.redman@futurenet.com)





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FIND A RHYTHM IN YOUR COMPOSITION THAT LEADS TO THE CHARACTER'S EYES



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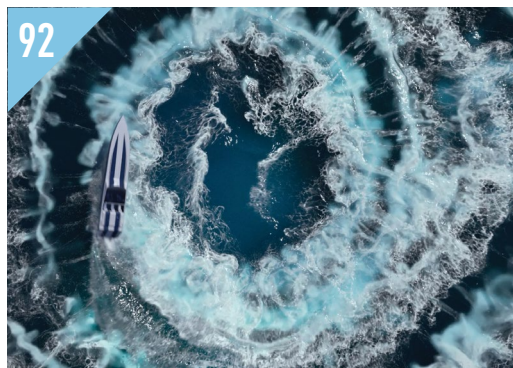
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# The Gallery

The best digital art from  
the CG community

## MAMA MONKEY



### ARTIST

Mariano Steiner

### SOFTWARE

ZBrush, Maya,  
Substance Painter

“It’s very interesting how our subconscious minds can guide our art if you are open to it. Trying to capture a moment in nature, step by step this project began to take shape and suddenly I realised this would be a portrait of a mother. She’s watching in the distance, giving space but ready to step in and fight if necessary. Fearless and loving. Devoted but also going through her own personal journey. This is most certainly connected to my own life and relationship with my parents. So I decided to call her Val, the Mama Monkey.”

● [artstation.com/marianosteiner](http://artstation.com/marianosteiner)

SHE’S WATCHING IN THE  
DISTANCE, GIVING SPACE  
BUT READY TO STEP IN  
AND FIGHT IF NECESSARY









# GUNNER

ORIGINAL CONCEPT BY BAGEUMI ([ARTSTATION.COM/BAGEUMI](https://artstation.com/bageumi))



## ARTIST

Kwangho Myung

## SOFTWARE

ZBrush, Maya, Marmoset Toolbag,  
Substance Painter, Unreal Engine 5

“This piece was based off a concept by a great artist that goes by Bageumi. As with any new personal piece, my main approach is to try and learn something new. My targets for learning in this project were mainly focused around XGen grooms, and Unreal Engine 5. Although not quite performance-ready yet, I strongly believe grooms will replace hair cards entirely in the near future for games. Keeping up with the latest software and tools is an important aspect to grow in alongside artistic ability as well!”

● [artstation.com/kmyung](https://artstation.com/kmyung)

ALTHOUGH NOT QUITE PERFORMANCE-READY YET,  
I STRONGLY BELIEVE GROOMS WILL REPLACE  
HAIR CARDS ENTIRELY IN THE FUTURE









# KING KRABBY

ORIGINAL CONCEPT

BY ALEXANDR LESKINEN

([ARTSTATION.COM/LESKINEN-AL](http://ARTSTATION.COM/LESKINEN-AL))



## ARTIST

SMRCKA Marie

## SOFTWARE

ZBrush, Substance Painter,  
Maya, Marmoset Toolbag

“I decided to interpret the amazing Alexandr Leskinen’s concept in 3D. I chose to start with ZBrush for making the high-poly because I really prefer to use my graphic tablet, but we could obtain the same result just with Maya. After this step, I put my high-res model in Maya with a low poly count to preserve my computer. I do my retopology with the Quad Draw tool for cleaner UVs thereafter.

After this step it’s time to bake! I prefer to use Marmoset, because Bake Groups are easier to make properly. We can also set up the low-poly cage to have a cleaner normal too, without it being printed on the mesh too close to each other – while keeping a beautiful ambient occlusion in general.

Next it’s time for one of my favourite steps: the texturing! For this I used Substance Painter. I like the hand-paint style as much as the PBR, so I decided to mixed them for making my little crab.

Finally, I import my low-poly model into Marmoset again for rendering.”

● [artstation.com/marie\\_smrcka](http://artstation.com/marie_smrcka)







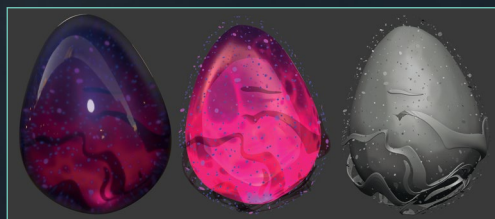
**ARTIST**

Olga Skaskevich

**SOFTWARE**

ZBrush, Marmoset

Toolbag 4



# JULITH

“This is a personal project I started a while back, as a part of Olya Anufrieva’s challenge. I’m a big fan of Ankama’s animation, and felt inspired to sculpt this particular character. In my personal work I like to focus on crafting an appealing image first, and less on the technical aspects. Using the combination of ZBrush and Marmoset feels like the easiest and the most intuitive way to do so for me. The model is posed with Transpose Master, the mesh is split into several polygroups, and they are assigned different materials. The egg she’s holding, for example, is composed of several layers of geometry with different material settings: glowing insides, floating sparkly particles, semi-transparent ‘clouds’ and the clear outer shell.”

● [artstation.com/olga\\_skaskevich](https://artstation.com/olga_skaskevich)





# THE BOY SAVIOR



## ARTIST

Richard Reyes

## SOFTWARE

ZBrush, Maya, Arnold, R3DS Wrap, Substance Painter, DaVinci Resolve

“I’ve never really played *League Of Legends* or any of Riot’s other games, but the show *Arcane* by studio Fortiche really immersed me into the world of Piltover and Zaun. Ekko quickly became my favourite character. So this is an homage to ‘The Boy Savior’, as he is dubbed in the show.

Ekko’s head was sculpted from scratch from a sphere. I used TexturingXYZ’s VFACE asset and wrapped the topology onto my sculpt using R3DS Wrap. TexturingXYZ has a ton of helpful tutorials available on its website that I would recommend checking out. I then applied the displacement map that TexturingXYZ provides onto the model in ZBrush.

The scene was set up in Maya. I hopped between ZBrush, Substance Painter and Maya to adjust the textures and the sculpt as needed. The scarf and the tank top was done quickly in Marvelous Designer, and the hair was achieved using Maya’s XGen. This was a really challenging part of the character; it was a lot of trial and error of trying different combinations and orders of the XGen modifiers to achieve this look.

Instead of Photoshop, I chose to comp the final image in DaVinci Resolve. Resolve’s colour grading tools are very comprehensive. I really wanted a sense that this was a frame taken out of a movie, so removing that clinical ‘CG’ feel was crucial. I added some camera motion blur and I also used a plug-in called Dehancer to achieve some of the colour and the grain effect.

I’d always wanted to achieve a cinematic feel to my renders, but felt like it had always eluded me. So a couple of years ago, I picked up a BMPCC 4K to learn how physical cameras and lenses work by shooting short videos here and there. I learned how to work with real-world lights, using modifiers to achieve the looks I wanted. This experience was invaluable to me, as the fundamentals of cinematography in real-world sets directly transfer into 3D. ”

● [artstation.com/renderenn](https://artstation.com/renderenn)



A COUPLE OF YEARS AGO, I PICKED UP A BMPCC 4K TO LEARN HOW PHYSICAL CAMERAS AND LENSES WORK... THIS EXPERIENCE WAS INVALUABLE









# ENDEAVOR - LAUNCH



## ARTIST

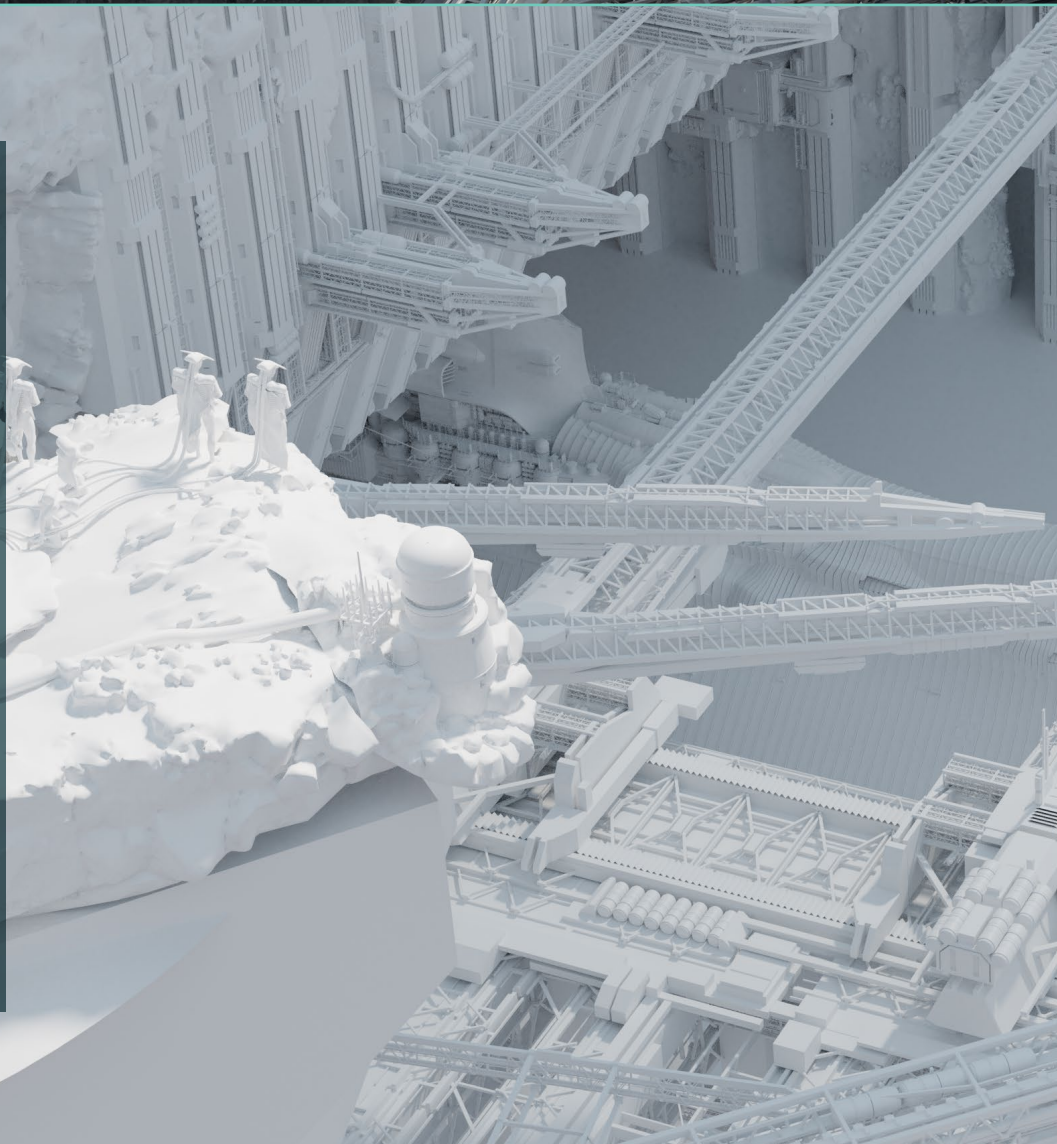
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## SOFTWARE

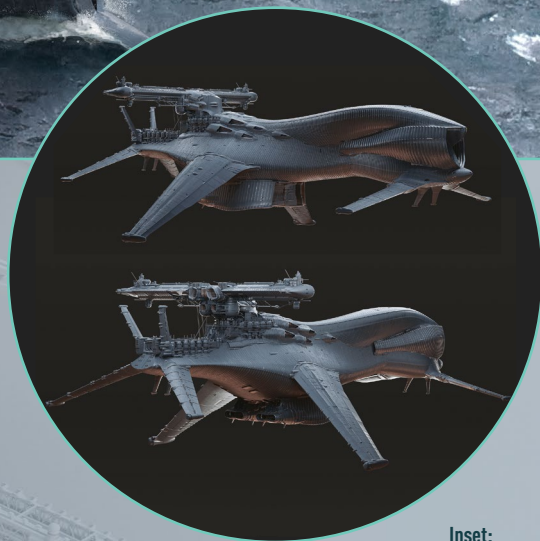
Blender, Substance Painter,  
Photoshop

“This artwork is part of my Game Design bachelor thesis project called ‘Endeavor’. It tells the story of the exploration vessel from its construction to its use on the high seas. The project was a challenge for me to not just design a plain vehicle but also to tell a story and bring character and context to it. This shot shows the launch of the ship from the shipyard. I used Blender for modelling and Substance Painter for the textures. The scene is rendered in Cycles and overpainted in Photoshop.”

● [artstation.com/imrahil](https://artstation.com/imrahil)







**Inset:**  
When designing for  
a game, the main viewing  
angles are the most  
important



# TIGER BOT



**ARTIST**

Massimo Righi

**SOFTWARE**

Maya, ZBrush,  
XGen, Arnold

■ ■ This is the fourth piece of a series of animal bots. Based on my tiger model I added the partial robotic/mechanical features for a kind of steampunk feel. An animated version can be found on my ArtStation. ■ ■

● [artstation.com/massimorighi](https://www.artstation.com/massimorighi)







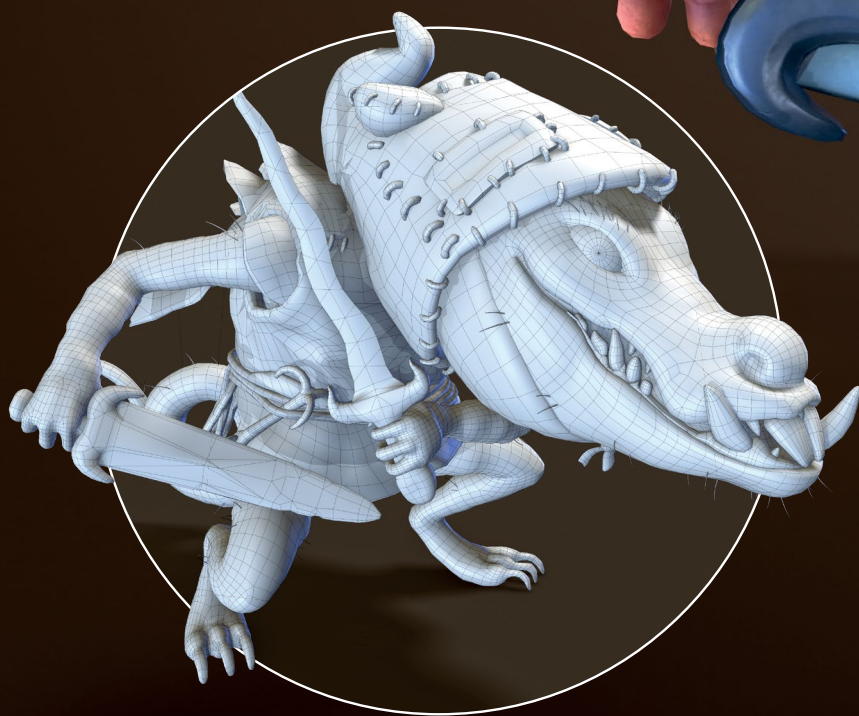




## THE ROOKIES

The Rookies is a platform to help digital artists get discovered without having to compete with professionals for attention. You'll get to the front page of those sites one day, but for now, we've got your back and want to help turn your passion for creative media into a successful career.

[WWW.THEROOKIES.CO](http://WWW.THEROOKIES.CO)







# ASSASSIN MOLE-RAT

**SOFTWARE** ZBrush, Maya, Substance Painter, Marmoset Toolbag  
**YEAR CREATED** 2022

I made 'Assassin Mole-Rat' during a 20-day school assignment. My goal was to translate a 2D concept to 3D, as well as making it game-ready. This is the first time I've gone through the entire process of making a game-ready character with animation, PBR texturing, and normal map baking. The original 2D concept was made by Justin Gerard.

● [www.therookies.co/u/Olivgron](https://www.therookies.co/u/Olivgron)



**ARTIST** Olivia Grönlund

**LOCATION** Sweden

I am 20 years old and have studied 3D game art at PlaygroundSquad for a year now. I also create 2D art focused on creatures and monsters using markers and pencils.





# *The rise and rise of* **UNREAL ENGINE**

From one-man band to global content creation tool, we delve into the history, ongoing success, and exciting future of this incredible real-time game engine

WORDS BY PAUL HATTON

**T**he story begins in the early 1980s with a young boy by the name of Tim Sweeney. Having hit double digits, Sweeney began his love affair with programming, reportedly clocking up over 10,000 hours before the age of 15. This devotion steered him down the games route, leading to him creating editing tools for shareware games in the early 1990s, but it took until 1995 for Sweeney to begin writing the code for what he is now famous for: Unreal Engine (UE).

UE's first game, *Unreal*, hit the shelves in 1998: a first-person shooter game for the PC. In those early years UE went head to head with the Quake Engine, developed by id Software. Years of fierce competition has pushed the gaming industry forward at unparalleled speeds, and decades after Sweeney's first attempt, UE looks very different. Underneath the interface there is a powerhouse of code that is now enabling developers to create next-gen games. Epic Games states that 48 per cent of next-gen games are now made using its engine; ➤

Right: Action-adventure horror game *Hellblade: Senua's Sacrifice* was realised using the power of Unreal Engine 4







## Feature

The rise and rise of Unreal Engine

➤ that's quite the market share, and just goes to show how popular this creation tool really is.

To put this popularity into perspective, Epic Games recently teamed up with Warner Bros using UE5 to create *The Matrix Awakens*. After only two months on the market, this game had been downloaded a whopping 6 million times. And it's not just this game that has impressed. At The Game Awards in 2021 *It Takes Two*, created using UE, won Game of the Year and UE-powered games won in nine different categories. Clearly, this engine can deliver the goods.

Alongside some of the top games being developed using UE, Epic Games has achieved broad appeal, seeing its game accounts surpass over 500 million users and downloads for the engine increasing nearly 40 per cent since the end of 2020. So what has caused UE to go from strength to strength? Why has it seen huge growth with others being left behind? What is so special about this engine? Let's take a look.

### PROLIFIC PARTNERSHIPS

Alongside the creation of excellent video games such as *Fortnite*, *Final Fantasy VII Remake* and *PlayerUnknown's Battlegrounds*, UE has also seen incredible popularity more broadly, most notably in the TV and film

industry. UE set out to dominate the games market, but this diversification of target markets has given the engine an enviable range of pies for its seemingly growing number of fingers. This not only maximises profits but also brings greater security, ensuring the company is not dependent on any one industry which could at any time experience a crash.

Filmmaker Jon Favreau has been one of the forerunners, not only advocating for but also utilising UE to create virtual worlds for *The Mandalorian*. Through partnership with Favreau, UE developers were able to push their research and development on a live project. Taking the vision and needs of Favreau, the team created tools that were imminently usable on the project before them.

Favreau's approach has become increasingly popular with the likes of Orca Studios and the producers of *Westworld* making use of UE at the very heart of its creative process. Speaking of *Westworld*, Epic Games said, "In season 3, showrunners Jonathan Nolan and Lisa Joy plus VFX supervisor Jay Worth also turned to futuristic techniques behind the camera, with help from Unreal Engine."

These partnerships and the thirst for continual exploration of what is possible has led to some incredible developments in recent



Right (top): Psychological horror *Observer: System Redux* was developed by Bloober Team using Unreal Engine 4. The game's aesthetic hits all the futurist markers brilliantly

Right: The heavy outlines and cartoon style of first-person shooter *Borderlands 3*, developed by Gearbox Software, are perfectly implemented

## Portability

Any idea, any platform

.....

UE is written in and supports C++, which makes it wonderfully portable. This is most notable in its ability to support a variety of platforms including console, desktop, mobile and virtual reality. UE has been traditionally strong in the console and desktop markets with many of the top-rated games developers choosing UE over and above other engines. UE's success on these platforms has been due to its history as well as the general level of hardware that is available on these platforms. Users report difficulties using UE for the mobile platform, citing performance and frame rate issues. Unity, on the other hand, is considered much more suited to mobile hardware, and it'll be interesting to see how and if UE makes any marked improvements in this area in the coming years. With an increasing amount of content being shipped to mobile devices, it'll be vital for UE to bridge any gap, real or perceived.







times. And this has not just been a big win for filmmakers, but for all users. Many of the tools developed in collaboration with filmmakers have found their way into releases of UE, including the multi-user collaboration tools, nDisplay system and live compositing.

UE's diversification and expansion into TV and film markets has increased its overall popularity, giving it a worldwide platform. It is fast becoming a one-stop solution for all of your virtual creation needs.

### PHOTOREALISM

UE is well known for its photorealistic capabilities. This is one of the main reasons that it has achieved adoption across a wide range of sectors, and the upward

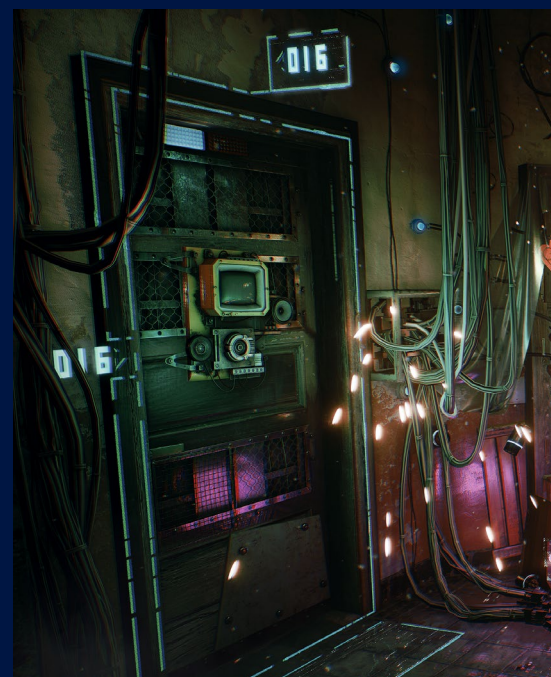
curve shows no sign of slowing down. UE is even gaining traction in the 3D visualisation industry as a viable option for creating photorealistic images and videos. The improvement of the software tools and the provision of ever-increasingly powerful hardware has meant that much more can be achieved 'on the fly' without needing to wait hours to achieve stunning photorealism.

Back in 2019 Quixel gathered together artists from across games, VFX and architectural visualisation fields to create its short film *Rebirth*. This was no cowboy attempt though, instead they delivered amazing results in every way imaginable. They did this by making use of Megascans taken from multiple locations in >



## ● Feature

The rise and rise of Unreal Engine



Top: Grungy textures give *Observer* a wonderfully dark theme, ideal for its cyberpunk horror setting

Above: *Borderlands 3*'s striking character designs are brimming with personality

➤ Iceland. The impressive part is that they were able to take huge amounts of scanned data, put it into UE and then render it in real time. Teddy Bergsman, CEO at Quixel, said this of the project: "With advancements in real-time rendering technology powered by Unreal, we set out to see if we could leverage Unreal and Megascans to create a cinematic with inherent photorealism in

real time, rivaling the results from traditional offline rendering."

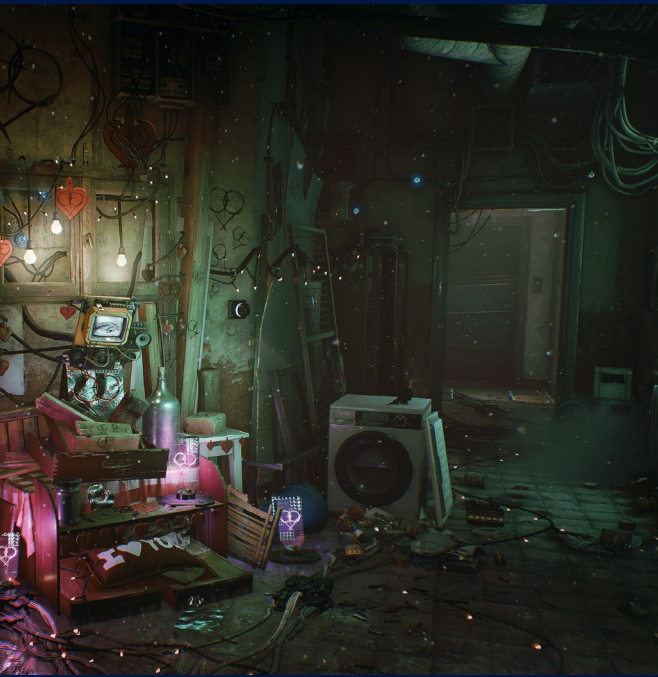
The following year Epic Games then released *Lumen in the Land of Nanite*, a real-time demo for PlayStation 5. This demo showcased what would be possible with version 5 of the engine. The realism that has been achieved is second to none. Every area from the landscapes to the characters have been developed in such a way

so as to truly push the boundaries of realism even further.

### AFFORDABILITY

Aside from the engine, one of the most striking things about UE is the pricing model. Epic Games operates a royalty model, so the more successful you are, the more you will pay. That sounds fair enough, but what is amazing is that payments don't start until you've





Left: The level of detail contained in these scenes in *Observer: System Redux* is truly impressive

Right: The technological narrative, set in a dystopian 2084, is brilliantly implemented



earned \$1 million USD in revenue. I think this is one of the biggest contributing factors to the wide-scale adoption and popularity of the engine. Epic Games has made the bar to entry so low that it's accessible to every aspiring creator. Any developer that makes the required revenue to pay the 5 per cent royalties will have already been hugely successful, thanks to the tools, provided by UE, that

made the project possible in the first place.

#### WHAT'S NEXT?

Will this growth continue? Will UE keep staying ahead of the curve as the world, at large, continues to evolve, change and adapt? These questions can only be answered in the fullness of time, but I think the team are giving it everything they've got and appear

to be putting their eggs in the right basket – most notably the Metaverse basket.

I know it's the popular buzzword at the moment, but it's not going away anytime soon so we may as well face it head on. For the uninitiated, the metaverse is a network of 3D virtual worlds, most commonly for the purpose of social interaction. UE is aiming to dominate not only the games, >

Above: Camera bokeh in this *Borderlands 3* shot ensures the focus is very much on the foreground



● **Feature**  
The rise and rise of Unreal Engine



Left: Upcoming *S.T.A.L.K.E.R. 2* will be one of the first games to be powered with Unreal Engine 5

Below, right: The world of *Hellblade*, developed by Ninja Theory, is inspired by Celtic culture







Above & right: Shots from *S.T.A.L.K.E.R. 2: Heart of Chernobyl*, developed by GSC Game World. It's amazing what they've been able to achieve with Unreal Engine



## Epic MegaGrants boost smaller companies

Make your pipe dream a reality

.....

To attract people to the UE platform and to speed up development progress, UE has started providing financial grants. If you're a developer looking to do something new, exciting and different but don't have the assets to make it happen, then maybe these grants are for you. Starting at \$5,000 and going up to a whopping \$500,000 there seems to be no shortage of money available for the right projects. These grants are perfect for a range of industries including games, film, TV and education. You will continue to own your IP and Epic Games does not put any limitations on how you publish it.

This approach by Epic is another move to ensure its continual growth across a range of markets. By attracting the best developers and innovators, UE will not only improve its offering but will likely lure creators over from other engines. These grants will also help UE move development forward in previously untapped industries or markets where they've only started to scratch the surface.

> film and TV markets, but is looking to be the engine of choice for creating the metaverse. Aside from releasing incredible tools to build believable worlds, they've also launched MetaHuman, a free app that enables anyone to create photorealistic digital humans. In only a matter of minutes it is possible to produce these realistic characters that include clothing, hair, and are fully rigged, ready for animation. This capability and the speed with which it can be done makes creating humans for the metaverse not only possible, but achievable at the click of a button.

MetaHuman's popularity is evidenced in the fact that after only two months of going live, there had been over one million digital humans created and downloaded.

Alongside MetaHuman and new features such as Nanite and

Lumen, UE is certainly looking very well placed to be the engine of choice for creating what will become the metaverse.

### IN CONCLUSION

Over the years, it has been fascinating to watch the development of Unreal Engine. To think that it didn't even exist 30 years ago just goes to show the sheer size of the leaps it has made in that time. Its growth has been helped by a competitive market that forces it to be continually moving things forward. Developments in hardware have also made possible what was previously impossible. Aside from these contributing factors, Sweeney and Epic Games have consistently used their talent to produce an engine that meets the needs of an ever-changing market.

Observer System Redux images courtesy of Bliober Team; Borderlands 3 images courtesy of Gearbox Entertainment Company; S.T.A.L.K.E.R. 2 images courtesy of GSC Game World Team; Halfblade images courtesy of Ninja Theory



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Incredible 3D-printed models by Backface, including a record-breaking reimagining of presenter Jon Bentley (above), and a ghost figure from *Destiny* (above right)



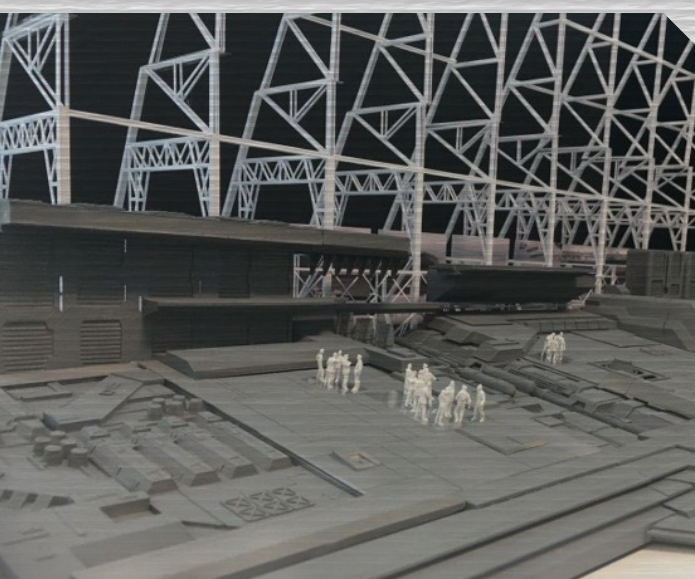
# SHAPING IMAGINATION & BUILD



**Below:** 3DPRINTUK's amazing 3D-printed model for a Hot Wheels and *Nitro Warriors* short







# 3D PRINTING BUILDING WORLDS



How is 3D printing technology leading to new creative opportunities? We interview three creatives for their expert insight

WORDS BY JAMES CLARKE

**Top (left):** A 3D-printed set design model indicates the scale of the eventual human performers in relation to the practical set elements built for a sequence in *Star Wars: The Rise of Skywalker* (image courtesy of Jack Cave)

Our conversation begins with props and modelmaker Jack Cave, as he sketches out how he came to work in the world of prop design and modelling. “From an early age, I had always been interested in 3D design and film, but I didn’t really know that a job in modelmaking was a possibility until I was at college studying architecture and 3D design. It was only when I got the chance to start building architectural models as part of the course that I realised modelmaking was really what I wanted to pursue. >





➤ After college I went on to study modelmaking at Arts University Bournemouth, and within a couple of weeks of graduating I managed to get a job working as a junior modeller in the art department on *Star Wars: The Last Jedi*.”

Cave then goes on to highlight the principal challenges of his work, and notes: “The main challenges always come down to timings – nearly everything has a very fast turnaround, especially on larger jobs. We’ll often produce one design, but then in a matter of hours a different variation of that design is needed. Being able to solve problems quickly is therefore vital, so rapid prototyping and sketch modelling techniques are essential for the quality and speed that I need to keep up with the various iterations of designs.”

With fantasy film projects allowing for a particular wealth of prop and set design opportunities, Cave notes how work on a fantasy-themed project like a *Star Wars* movie or *Aquaman* differs in terms of a project set in our world in terms of creative choices. “Working on any fantasy film is great and it’s always fascinating to see the coming together of the imaginary worlds of the director and the designer,” he explains. “The freedom of not being limited to the real world does however have its challenges, for example it’s sometimes difficult to understand the proportions of



CGI monsters compared to their surroundings. Films set within our world tend to have a slightly different feel, especially from a modelling point of view, as often we are tasked with designing architectural buildings where the details and dimensions are true to life. Whilst I really enjoy the freedom of a fantastical story, limited only by imagination (and budget!), I personally prefer working on films based in the real world, but with a supernatural element to them – you can feel

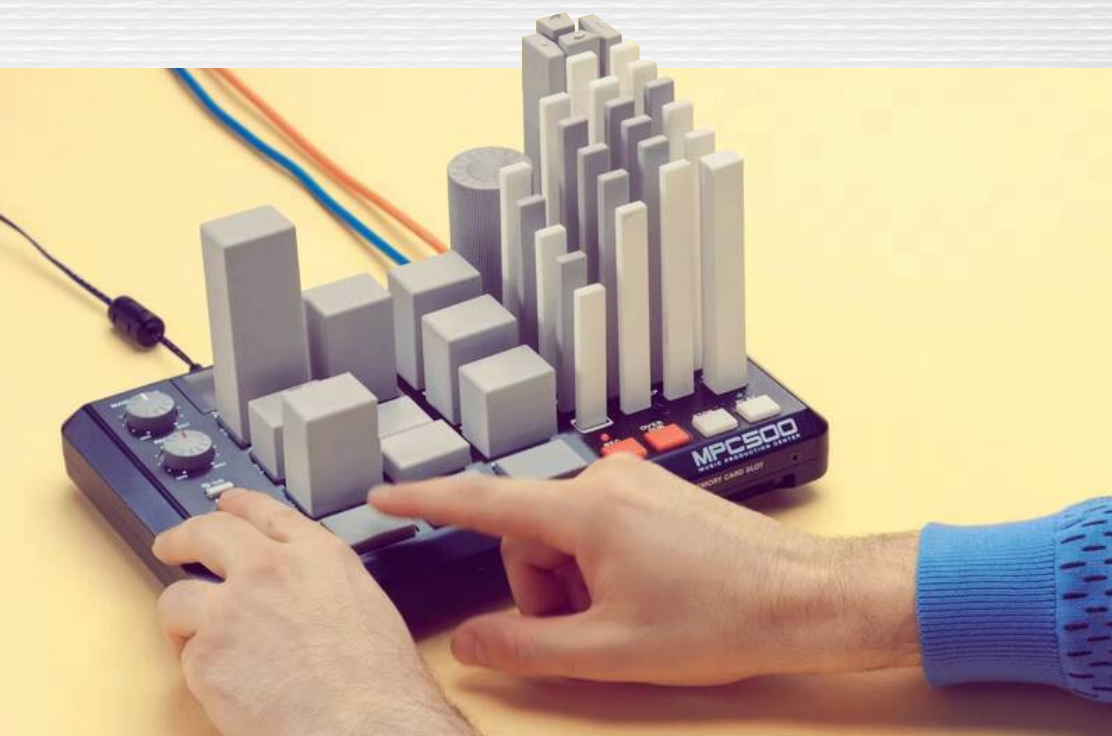
**Top:** 3D-printed wedding cake topper produced at Backface’s studio in Birmingham

**Above:** 3D printing can be applied to a large set design project, or the most delicate miniatures – such as this hair clasp produced by 3DPRINTUK

grounded in the storytelling but are also not limited by the realms of possibility.”

“Its simplicity and ease of use are what got me very interested in the Glowforge back in 2015,” reveals Cave. “Up until then I’d only been trained on bigger industrial laser-cutters, but the Glowforge’s simple interface and single button design made it perfect for use in the art department. The built-in camera and Proofgrade materials (materials available on the Glowforge website that are





designed to be recognised by the machine) also make less waste, which is very important to me, as I tend to go through a lot of materials. The ability to quickly throw something in and cut it out without having to measure the offcuts and work out the settings suits my working style perfectly.”

For Cave, “Glowforge provides such a user-friendly tool that literally anyone can use without any training. The ability to trace from within the machine, then use the outline tool to cut out

and duplicate is a great way to quickly use it for sketch modelling. And the ability to create custom settings for any material is also hugely beneficial.”

In more recent years, film production has seen 3D printing becoming embedded in creative collaborations. “The ability to have a physical set model or concept prop in hand is very important in helping to inspire any creative process,” Cave explains. “But far more than just a discussion piece, it provides the director and >

**Top:** 3DPRINTUK has also delved into stop-frame commercial work, like this promo video for Belgian electronic music platform Hello Play, featuring an AKAI MPC500

**Above:** Composite scan work produced at Backface



## Props for film

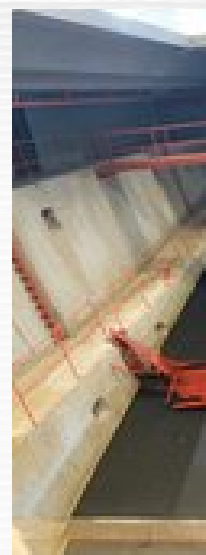
Tim Milward takes us through a typical working process for a prop commission at Backface in Birmingham

“Last year we worked on a project producing three Egyptian artifacts for a film. The studio’s designers had already worked on some 3D models, so we knew exactly what they needed to look like. In the film, they were to look like gold and silver, covered with precious stones like diamonds and rubies. The props were going to be used as a promotion and given away as competition prizes.”

The particular use of a prop will determine its detail, as Milward elaborates: “How close up they’ll need to shoot the object or how it’s going to be handled will be part of the decision-making process. We’ll deliver some rough outlines of the final options to the client, with our views of any pitfalls we can anticipate and the pros and cons of each approach.

“The making of a prop is just a process of keeping track of all the different parts that are going on: printing, moulding, casting, soldering, polishing and setting – making sure everyone’s on track with the timeline that we’ve put together and keeping the client updated if anything slips. Once the pieces are done, they’re collected and whisked off to their final destination and we eagerly anticipate seeing them on screen.”





**Top:** An image from Backface's diverse portfolio – don't leave your snacks unattended...

**Above (left):** Silverware from Backface's 3D printing work

**Above (right):** A 3D printer at Backface capable of full-colour results

**Right:** An enthusiastic Christmas bauble produced at Backface







## Printing Bond

Jack Cave, modeller on *No Time to Die*, reveals how 3D printing was utilised for the film's set design

"During the production of the latest James Bond film, *No Time to Die*, one set that the Glowforge helped heavily on was the Russian submarine pen, where Bond enters Safin's island. This set had to be angled in frame to provide the illusion that the submarine had partially subsided, so we decided to build a ½" to 1' scale model to help visualise it better.

"This presented several key challenges, including making sure the model components were waterproof and ensuring that we could accurately show the water's reflections, as well as the action of the glider landing in the water.

"Working from 3D models from the art directors and concept artists, I would create 2D templates that could be laser cut on the Glowforge and used to build the bigger structures as well as the smaller details such as ladders and broken walkways. Using thinner, laser-cut materials is great for replicating larger objects, and using a heat gun or a lighter to bend and manipulate materials and add details really helps build people's understanding of what the set will ultimately look like.

"The final set models that I created were then subsequently used in production meetings as on-set visual aids for the construction crew, and to provide the VFX department a 3D visual that had been approved by the designer and director."



**Top left:** Film set design utilises 3D printing to determine scale in this image from a submarine pen in *No Time To Die* (image courtesy of Jack Cave)

**Top right:** A 3D-printed set allows filmmakers to plot out approaches to filming (image courtesy of Jack Cave)

**Above:** Workstation at Backface's studio

> director of photography with accurate details that they can then use to discuss shots and lighting setups. The Glowforge's speed and accuracy is super helpful as it allows us to make on-the-fly changes as well as beautifully detailed finished pieces that are used in the final shots."

This fusion of practicality and creative choices comes through as the conversation continues with Marc Vinall, at 3DPRINTUK. He begins by noting that for the company, "SLS Nylon is an absolute go-to technology. It has little to no design limitations and is perfect for a detailed one-off part, or a high quantity of parts. But ultimately the quality and strength of the parts are superior."

Addressing the relationship between traditional and new ways of fashioning props, Vinall notes that "3D printing will never

replace traditional prop making, it's simply an additional tool to be used wisely with modelmakers. Hybrid props will always produce the best and most efficient results, no matter which method you use.

"Secondly, it's about realising which technologies and materials are best to use, much as you would with choosing between wood, metal or plastic. Although SLS Nylon is extremely versatile, it's important to know when to use this technology and when to branch into others and make use of their unique properties.

"One of the opportunities that 3D printing technologies brings is simply to create parts more efficiently than other means available. This is mostly in regards to the creation of complex geometries, or parts in mass where it proves quicker and more efficient than traditional >



## ● Feature

### 3D printing

➤ silicone moulding. With our high volumes of machines, we are capable of printing many thousands of complex parts in just days, which could often take a team of modelmakers weeks or even months to produce. Aside from 3D printing large objects, there's often no limit to what we can manufacture ready for SFX teams to paint and assemble."

Given that 3D printing is still relatively new to many, Vinall observes that, "In my experience, film and TV appear to be amongst the slowest industries to widely benefit from the use of 3D printing, and creating a fluent and regular workflow with this process. But I do see this changing as the new breed of makers are now becoming more efficient in the fields of 3D design and 3D printing."

This emerging recognition of 3D printing as a benefit for film and TV production underpins Tim Milward's observations, speaking to us from his studio Backface, based in Birmingham. He explains how the company has found a place in 3D printing and prop production for film and TV by noting that, as the saying goes, "It takes a community to build a village, and that's very much what the world of film and television is like, it's many people from all sorts of backgrounds lending their respective skills to a project. People see your work then go onto new projects and people talk, pass on recommendations and make introductions. From what I've experienced, word of mouth and reputation play a huge part in getting new work."

Of the challenges and opportunities that Milward and his colleagues typically find themselves responding to in the context of film, commercials and TV projects, "timing's probably the biggest challenge we face when working on these projects. Quite often, things need to be turned around very quickly and, whilst 3D printing has its advantages, it isn't always the quickest way to do something," Milward explains. "The larger the project, the more people that need to have input and sign-off on the finished design too, so before the printing starts, the designs need to get approved,



**Top:** Backface's studio space in Birmingham

**Above:** A selection of 3D-printed figures produced by Backface for personal gift use

amended and approved again by various stakeholders along the way, which can eat into valuable production time."

As 3D printer technology rapidly advances, Milward is keen to note, "I don't think I'd favour any one particular technology; it's just about picking the right machine for the job. We probably use SLA printers the most for this type of work, but sometimes we'll have jobs that call for full-colour printing or the speed that this type of printer offers, or FDM machines to produce larger items at a reasonable cost. The SLA machines we use give a nice surface finish, so cleaning and finishing is simpler and the resulting pieces are nice and robust, so they can handle a knock or two."

Of the dynamic between the 'traditional' process of prop-making and the opportunities

offered by digital printing, Milward makes the point that, "Like in other industries, 3D printing is complementing the traditional processes rather than replacing them, and I think of it more like another tool that we can use. Digital design helps speed up the design process, with ideas able to be shared quickly with stakeholders and concept art produced that looks more like the finished prop than traditional sketches."

He concludes, "There are still plenty of traditional processes involved: most parts still need finishing and painting, or we may need to take moulds and cast pieces into other materials – 3D printing certainly speeds up part of the workflow, but it's not like a *Star Trek* replicator where you can press a button and out comes a finished piece."



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# Technique focus

Incredible 3D artists take us behind their artwork

## DEVELOPING IDEAS WITH AI

Here are some frames I did mixing AI with 3D renders and paintovers, exactly how I might have done working as a matte painter, but using AI as a photobash source (never as a final result). I used Disco Diffusion to generate a starting frame from a comp I uploaded. Then I selected one of the results as a base for the 3D part, posing the camera and setting a quick light rig that matched the Midjourney output. In parallel, I took the selected DiscoD prompt and did several frames, from which I used parts as photobash elements.

Finally I composited all elements together and added paint details such as rocks, bubbles, a face, and designs on the suit.



**Syllo**  
(Sylvain Lorgeou)  
[artstation.com/syllo](http://artstation.com/syllo)

Hi! "Syllo" here, I live in Canada and work in the VFX industry as Head of Visual Development at Framestore.







WHAT LURKS IN THE DEEP  
(3RD OF THE SERIES)  
Software Disco Diffusion,  
Midjourney, Blender, Photoshop  
Year made 2022



# The Pipeline

Practical tips and tutorials from  
pro artists to improve  
your CG skills



## ANA KAONA

3D project based on a  
concept by Luigi Lucarelli,  
created entirely in Maya



MAYA

# CREATE CINEMATIC LIGHTING IN MAYA

Discover the magic of bringing your character to life by following Eidan Elgrably's step-by-step guide

**T**his piece, 'Ana Kaona', is a 3D project based on a concept by Luigi Lucarelli. I have been influenced since childhood by Pixar and Disney feature films, and aim to create cinematic shots that convey the aesthetic of these studios.

In this tutorial, you will learn how to implement lighting

techniques, and learn some design concepts to keep in mind in your own workflow. Remember, it's not about the tools, it's about the thought process behind them. You might find my approach to lighting simple, and it is, but it requires knowing what to look for in your image. This tutorial will guide you through those principles and

will give you the knowledge to create cinematic lighting for your own characters.



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## AUTHOR

### Eidan Elgrably

Eidan is a self-taught 3D artist based in Tel Aviv, Israel. He has most recently worked as a lighting supervisor on the upcoming animated short *Black Slide* directed by Uri Lotan.  
[bit.ly/3xltSXA](https://bit.ly/3xltSXA)



## 01 SET UP ACES

The ACES workflow is the industry standard for colour management, and the most significant reason for you to use this system is for greater photorealism in your renders. That's because of the wider dynamic range that it gives you compared to the standard sRGB. If you use ACES, make sure all of your assets' textures are set correctly to work in this system.

## 02 LAYOUT THE SCENE

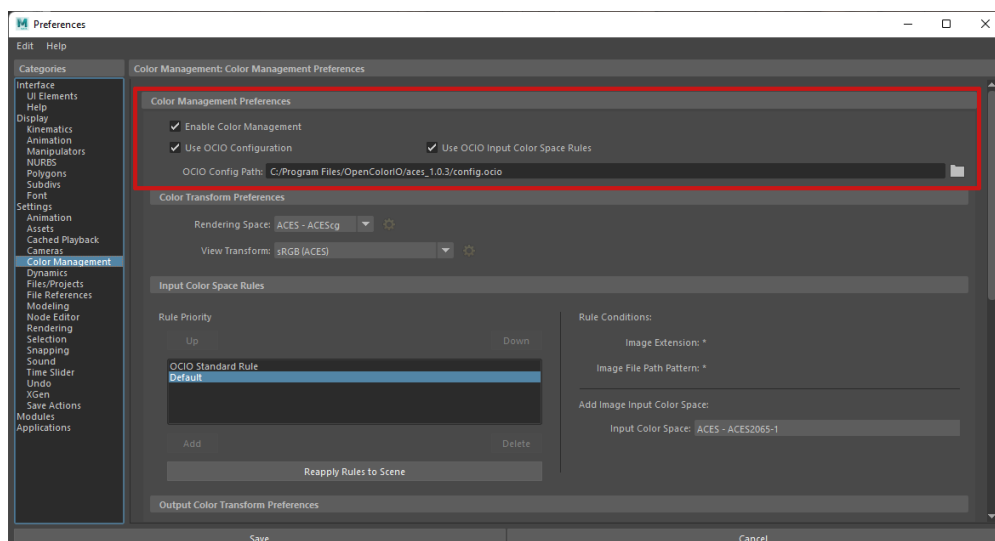
You can either use your own models or find assets from sites like Megascans. Make sure that the assets chosen support the intended story of your main character. You can change the assets' placement later, but try to consider the depth of your shot: what's in your foreground, midground and background. You can even use an image for certain elements of the background, such as the sky.

## 03 SET FOCAL LENGTH

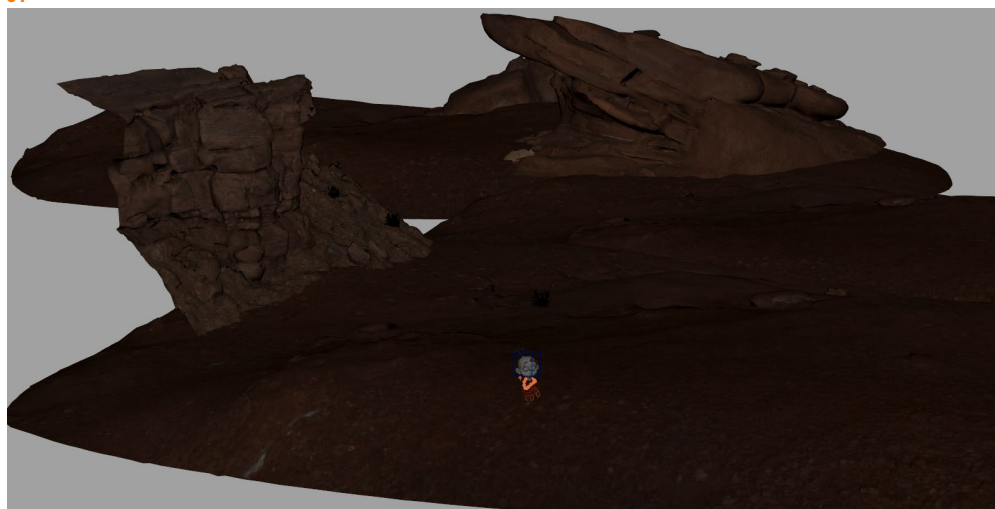
Before finding your composition it's important to set up your camera. Different lenses will dramatically change your shot. Use a longer focal length (telephoto lens) to achieve a flatter background and less distortion on your character. Alternatively, you can use a wide-angle lens to get a greater sense of your surroundings.

## 04 COMPOSITION

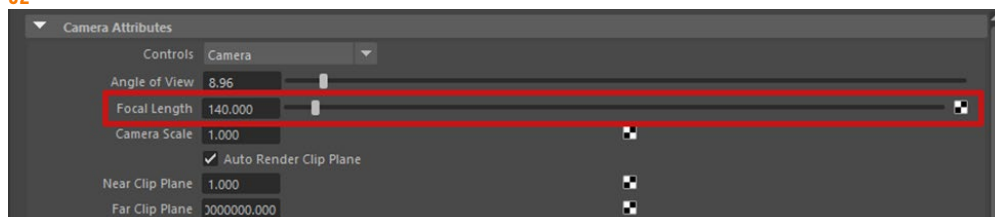
Know where the focal point of the image is – where you want the audience to look. For a character the focal point is often the eyes, so try to find a rhythm in your composition that leads here. A 'good' rhythm will naturally guide the audience to your focal point, and can be achieved by paying special attention to every aspect that comprises your frame. Every element in the composition is important. Think about negative spaces within your composition, do they create an appealing shape? Try to arrange the different elements to create the sense that they are 'pointing' to your focal point. Using contrast is a great way to do that: light vs. dark, straight lines vs. curves, big shapes vs. small shapes are key in making your character pop within your composition.



01



02

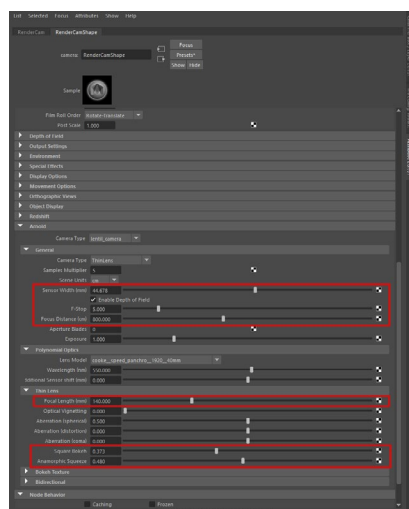


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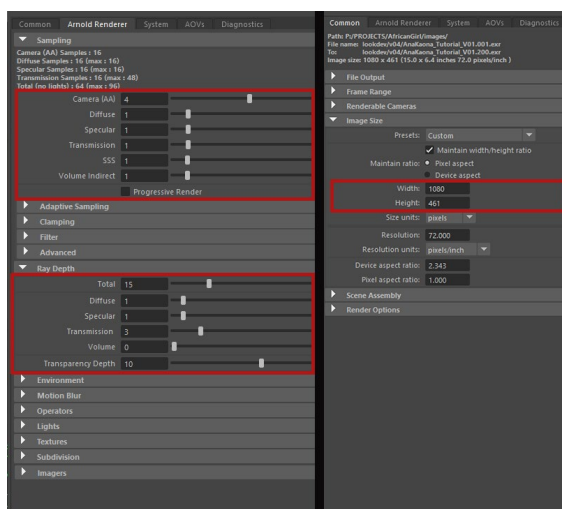


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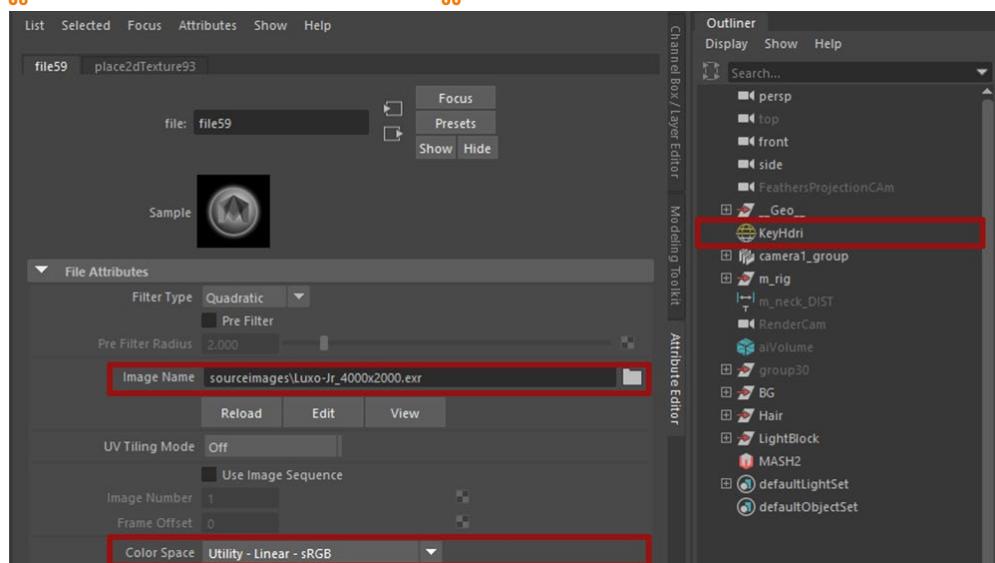




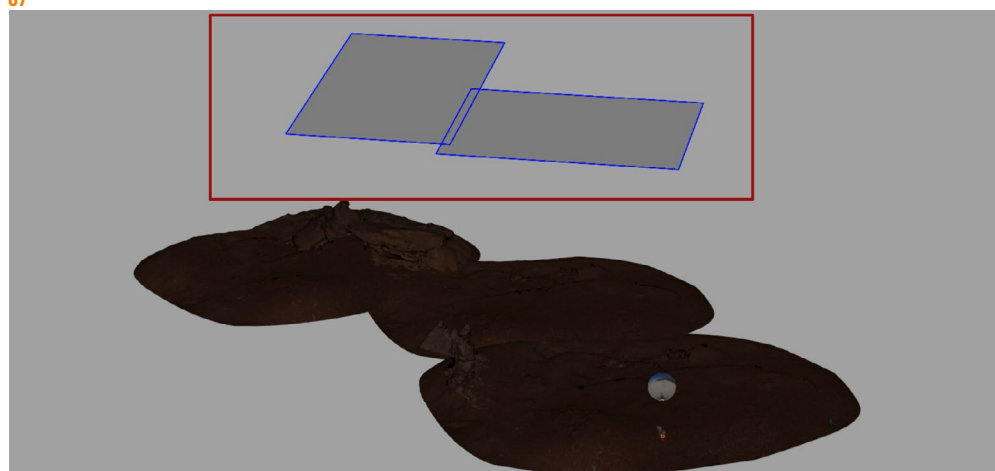
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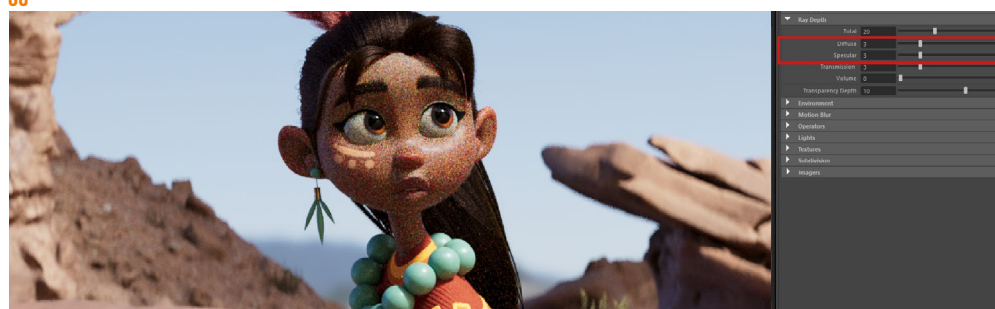
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07



08



09

## 05 SET LENTIL CAMERA

Lentil is a free plugin developed by Zeno Pelgrims. It extends the abilities of the default Arnold camera tools, and it also cleans up the bokeh effect faster than the Arnold native render. Set up the same focal length as the initial Maya camera, and change the bokeh stretching effect to achieve a more anamorphic bokeh. Set the focus distance as desired. You can also play with the F-stop for a more detailed or blurred background.

## 06 ADJUST ARNOLD TEST RENDER SETTINGS

It's important to optimise your render settings while working on your scene. Doing so will reduce idle waiting time between iterations, and allow a more seamless workflow. Make sure you set your render to a low resolution while working.

## 07 CREATE KEY HDRI LIGHT

When trying to achieve natural daylight lighting, the best method is to use a really good-quality HDRI. You can find them for free online, for example on the RenderMan website. Rotate your light until you find an angle that flatters your character.

## 08 ADD GEO PLANES

Geo Planes or any other Geo can be used to create shadows in necessary areas of your shot, by blocking the light source. Don't just throw an HDRI and think you are done – try to think what your shot needs in terms of balancing light and shadow. You can also use Arnold light blockers in place of the Geo Planes, but it really depends on what your individual shot calls for.

## 09 MODIFY RAY DEPTH TAB

Bounce light is an integral part of creating realistic lighting. You might find that your image is missing quite a bit of bounce light. The reason is the Arnold Ray Depth setting – which might be set to make the light bounce only once. Changing the diffuse and the specular to 3 will result in an increase of bounce light in your scene.

## 10 ADD GROUND PLANE

You can use a ground plane to produce more bounce light in your image. Consider making





10

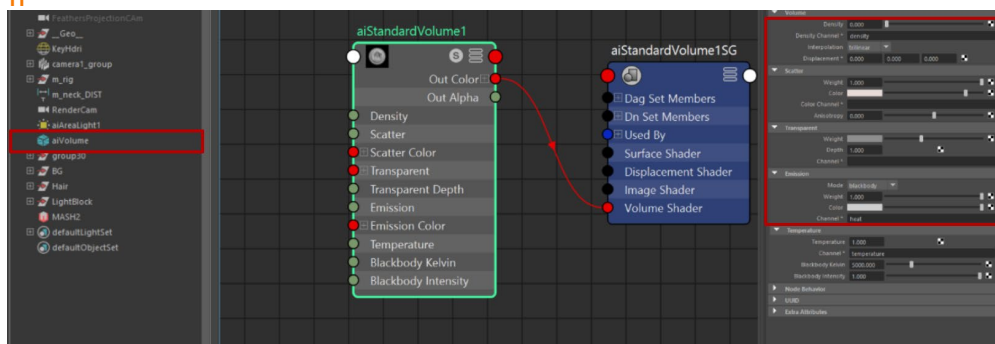
➤ adjustments to the plane such as tweaking the diffuse colour – this will change the colour and the intensity of the light. Try to avoid adding light sources before absolutely necessary – bounce light makes the scene more harmonised and connected, and managing it properly might be the key to finding the perfect lighting for your scene.

## 11 BLUE FILL LIGHT

Remember when we discussed the importance of contrast in your composition? Warm vs. cool light is another vital aspect you should be thinking about. Your scene might lack balance between these tones – blue fill light mimics the reflected light from the sky, and will help achieve that balance.



11



## 12 ADD FOG

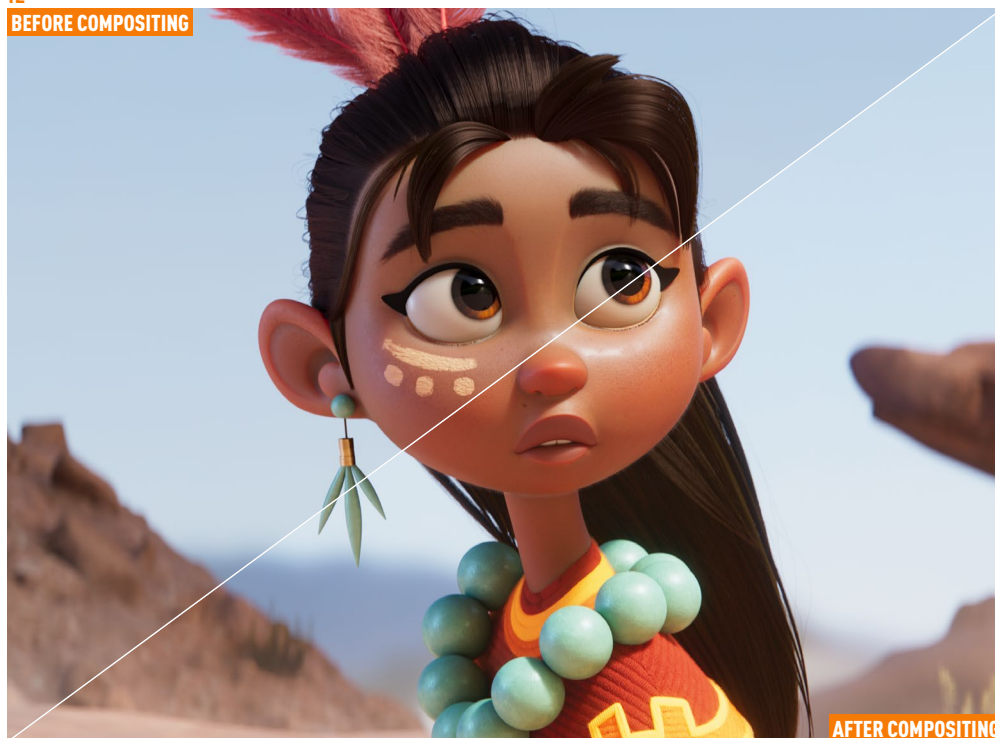
There are many ways to create a fog effect in your shot. One way is to use VDB Cloud. There are both free and paid versions available for download online. Using a cloud with low density will cause your cloud to look more like fog or dust. There are several advantages to using fog in your scene: it helps create depth in your image, it can add contrast to different elements of the scene, and it creates a unified feeling.

## 13 FINAL RENDER

Once you are satisfied with your lighting, set your render to your desired resolution and bump up the Arnold render settings. For a single frame use higher resolution despite the long render time. Once rendered, move to your preferred compositing software and add some contrast, saturation, glow, film grain, and camera distortion (which can also be done with the Lencil plugin). Be aware that the goal is to enhance your render and not to overly manipulate the image. •

12

BEFORE COMPOSITING



13

AFTER COMPOSITING





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**A GLASS OF RED, SIR?**

A still from one of our newest shorts titled "Fine Dying"





BLENDER | AFTER EFFECTS

# BUILD A TOON-SHADED ANIMATED SHORT

How to make charming, 2D-style animations in 3D

In this tutorial, we'll take you through our process for creating animated shorts for our series *Natural Habitat Shorts*. We post on TikTok, Instagram and YouTube where we've amassed over 2 million followers across platforms and over 150 million views. Each video is around 10-30 seconds long and takes about one to two weeks to make, so in the year that we've been making these shorts we've got the process streamlined.

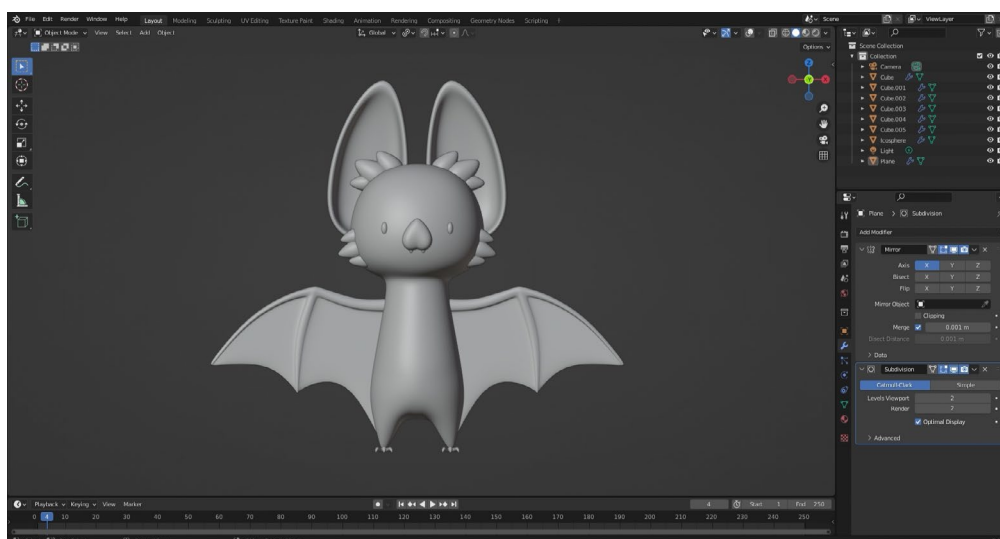
All of our shorts feature a gag about an animal existing in the human world. The gag is usually inspired by our own life experiences, or by a fact about said animal. Each of our videos are accompanied by a fun fact in the description to help explain the joke and also educate our audience on the animal world. We want our videos to come from very mundane and everyday circumstances – situations that everyone has found themselves in every once in a while. From there we try to take it and see what animal could absolutely turn that scenario on its head.

Our animations utilise a Custom Toon Shader made in Blender, which we use to try and give our shorts that charming, hand-drawn look. Aside from mouth shapes, the occasional facial expression and some backgrounds, everything is done in 3D. Elements that are not in 3D are produced with After Effects or Procreate on an iPad.

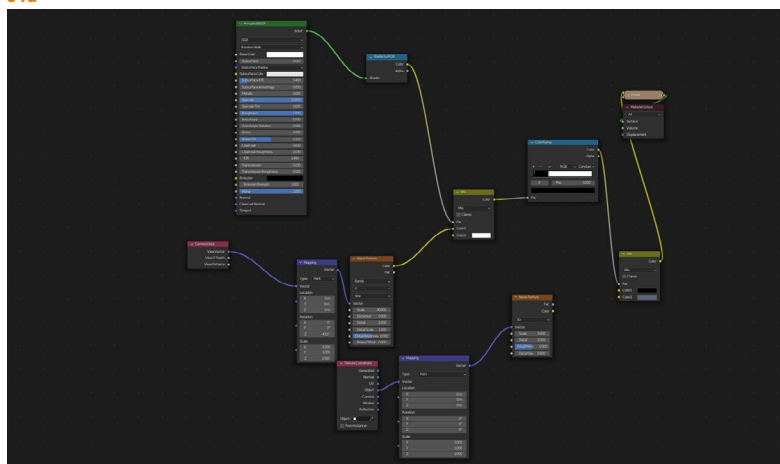


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01a



01b & 02

## 01 MODEL CHARACTER AND CREATE EEVEE MATERIAL

Begin by building out your character using simple shapes, starting from cubes, spheres or planes.

When you have finished modelling, we can move onto creating our EEVEE material. In the node network, plug the Principled BSDF shader into a Shader To RGB node. Then add a Wave Texture node and a MixRGB node. Plug the Wave Texture node and the Shader To RGB node into the MixRGB node,

with the Mode and Factor set to default (Mix and 0.5).

Add a Color Ramp and plug the MixRGB node into the Color Ramp node. Set the Falloff to Constant and adjust the sliders to your desired preference. You now have stylised shading. From there, add a second MixRGB node.

## 02 TEXTURE AND COLOUR

Either import your desired texture or create a procedural texture (in our case, our animal is

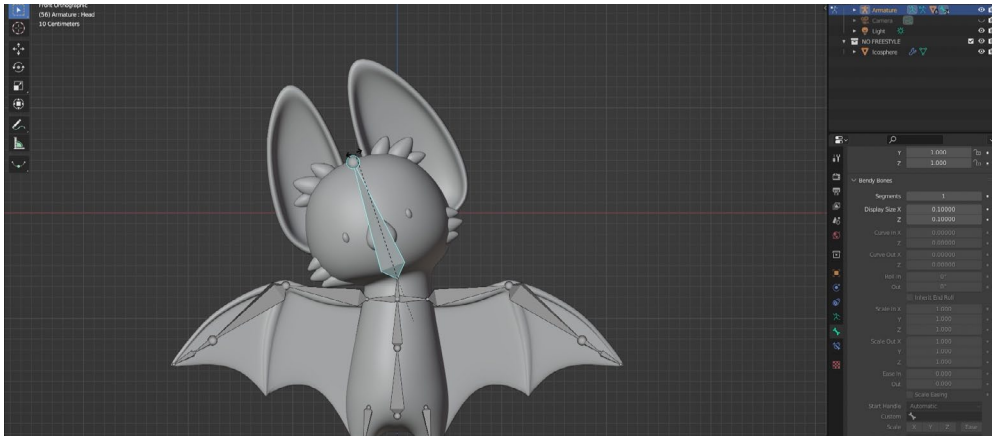


## AUTHORS

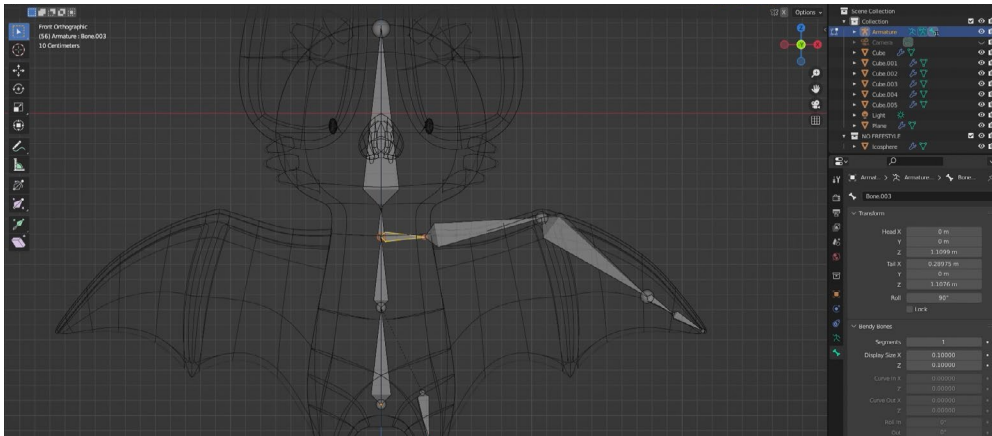
**Brennan Brinkley,  
Nicole Low,  
Tyler Kula**

*Natural Habitat Shorts* is a series of animated videos on TikTok, Instagram and Twitter, created by three former animation students who decided to start a passion project with the main goal of making each other laugh.  
[naturalhabitatshorts.com](https://naturalhabitatshorts.com)

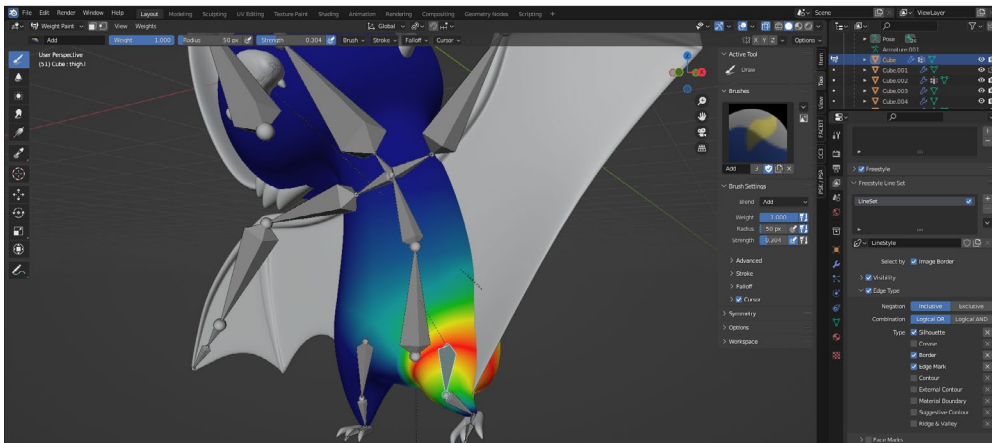




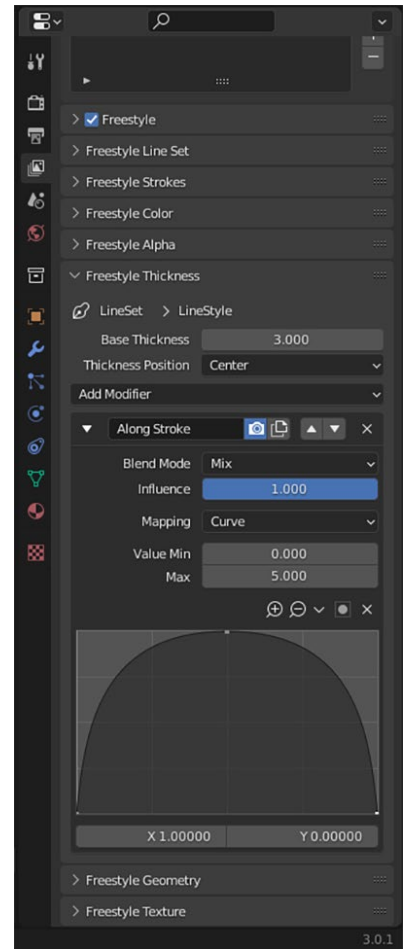
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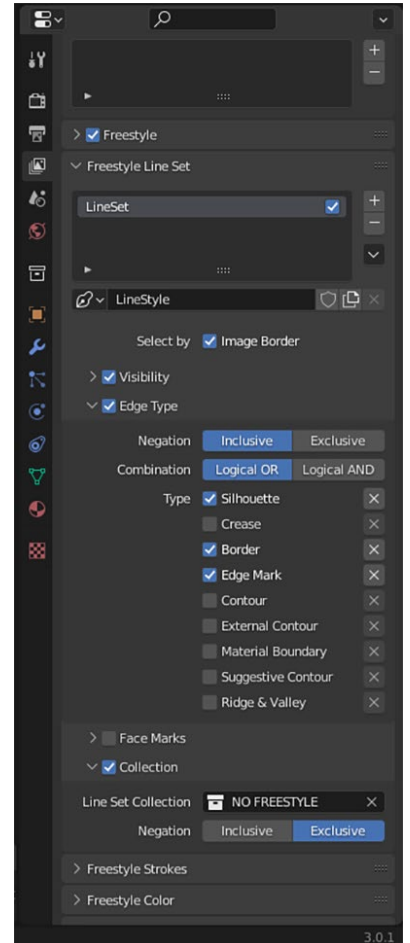
04b



04c



03a



03b

**Animate in 3D**  
Doing all of our character animation in 3D not only saves time, but helps us to keep a consistent aesthetic across all of our videos. It also allows us to quickly make changes to the camera angles and shot design without having to redraw everything.

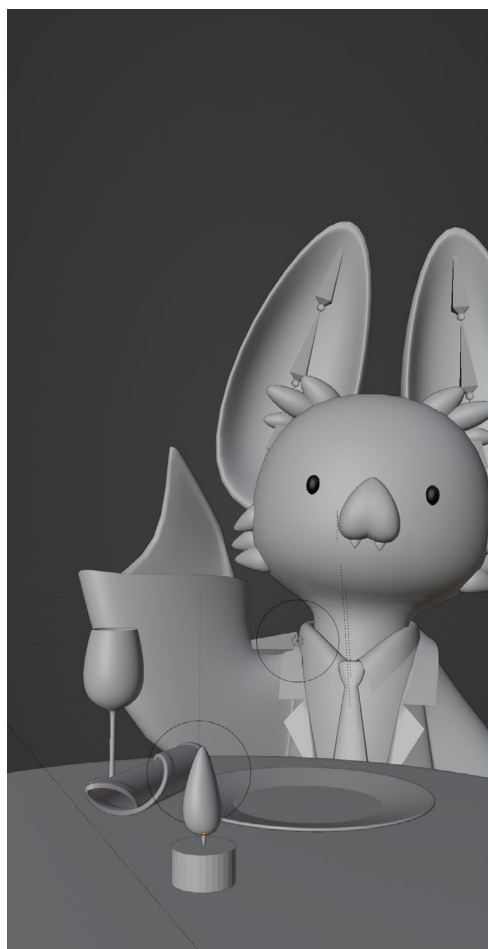
only one solid colour, so we use an RGB node and choose the colour). Plug your Color Ramp output into the MixRGB node's Factor input, and in Color1 choose your shadow colour. Plug your Texture node into the MixRGB's Color2 input. Finally, plug MixRGB into an Emission shader or Viewer node.

**03 CREATE THE OUTLINE**  
In the Render Properties tab, turn on Freestyle. Then in the View Layer Properties tab, scroll down to Freestyle Thickness. Add the Along Stroke modifier and change

the Mapping from Linear to Curve. Create a parabola-like curve that starts at 0, rises to 1 and falls back to 0. Set the Max value to 5. In the Edge Type tab check the Edge Mark box. This is optional but you can select edges on your model that you think should be defined by linework. Just right-click and select Mark Freestyle Edge.

**04 MAKE YOUR SKELETON**  
Open the Armature tab, scroll down to the Rigify panel, click on the Add Sample button and edit the bones to fit your character.





05a



06



05b



07



**WATCH  
THE VIDEO**

<https://bit.ly/3D-world-289>

### Achieve a hand-drawn feel

To make the 2D style more convincing, we keep our characters mostly at a three-quarter view like most cartoons. We also add a turbulent displacement to the characters to give it an organic, hand-drawn feel. A limited colour palette, with one to two colours per model, will also help make the 2D animation more convincing.

Next, press Ctrl+P to parent your skeleton to your model.

Enter the Weight Paint mode by pressing Ctrl+Tab. The colours visualise how much a joint affects the mesh.

## 05 POSE, ANIMATE AND RENDER

Pose your character and create keyframes. Scrub through your animation and adjust until you're happy with it. Turning on Auto Keyframe can be helpful.

In the Render tab, set up a file location for your renders and set your fps – 12 fps is ideal for the 2D look. Then hit Ctrl+F12 to render the animation.

## 06 CREATE THE BACKGROUND SCENE

Model or download set pieces – these models can be very low-poly as you just need the general outline. Texture the models using the same process outlined before. Arrange your models in the scene. It's helpful to look at reference pictures of your desired location to get the most realistic-looking set. Set up your camera and render.

## 07 COMPOSITE

Open After Effects and bring in your animation render as well as your background. Place your character render above the background render, and there's your final animation. ●





**AUTHORS**

**Victor Perez**

Victor Perez is an award-winning film director and VFX supervisor who has worked on several Hollywood blockbusters, and is considered a visual effects compositing master and Nuke guru. His portfolio has earned him a number of awards worldwide. [www.victorperez.co.uk](http://www.victorperez.co.uk)



DAVINCI RESOLVE

# FILM HIGH-END VISUAL EFFECTS

Discover how to capture high-quality VFX using a small, inexpensive camera, with these expert tips from film director Victor Perez

**A**s a VFX supervisor, I am always seeking to develop new ways to improve visual storytelling using technology, but one cannot simply grab a camera and start testing ideas... or can you? Technical imaging specs for certain tests require sophisticated technology and camera-specialised roles to handle them, and producing the test becomes completely cost and time ineffective as a result.

When the first Blackmagic Design Cinema Camera was released in 2012, I was very excited as it was a true game-changer for filmmakers... but when I performed a few tests for visual effects purposes, I was frankly disappointed as that camera was not much

better than any DSLR for the image precision required, and the workflow was bulky and inefficient.

However, the technology continued to evolve and Blackmagic seemed to be committed to creating a serious competitor to the 'big guns' of cinematography, but accessible to anybody. A few weeks ago I started a new research project, and attracted by the latest evolution – the Blackmagic Pocket Cinema Camera 6K Pro – I decided to give it another chance to see how things have changed... >



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01a

## 01 GREEN AND BLUE SCREEN PERFORMANCE

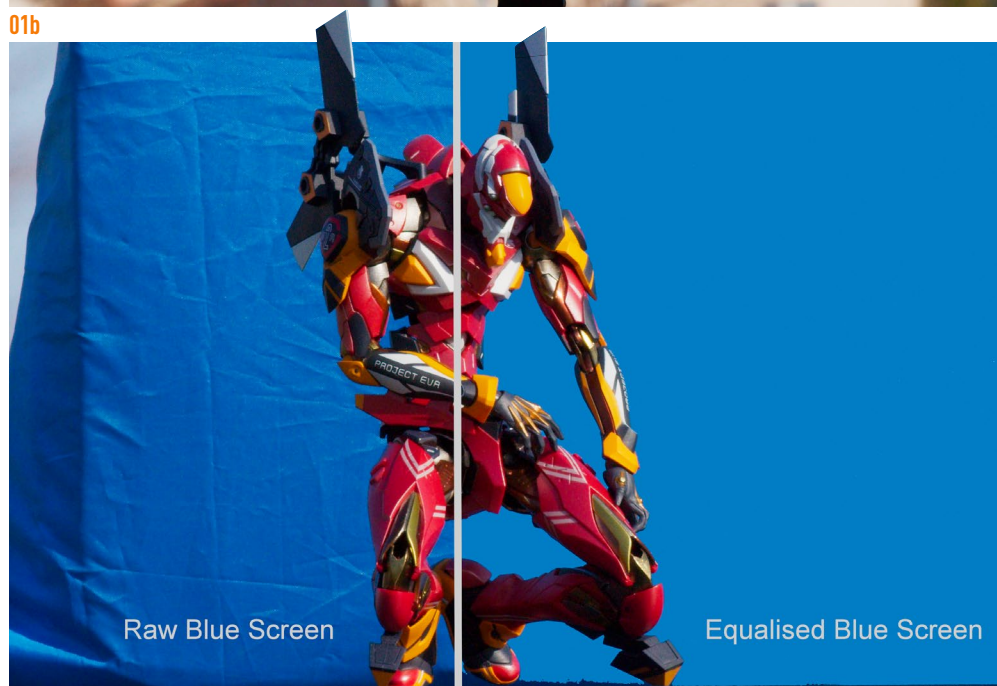
Testing the quality of the camera with green and blue screens was my first goal. To get more critical results, I tried high-colour-contrast hard edges (red against blue), and I decided not to use a perfectly lit and even blue screen. Instead, I used a wrinkled polyester blue bag simply lit by sunlight. I tried my best to achieve the best possible outcome given this setup, so the better the capture, the more margin I would have in post to get a solid key.

I set the camera at the parameters for green screen work and the BRAV codec at maximum Constant Quality (Q0). This isn't purely RAW, as the demosaic stage happens in-camera, but it is a good high-dynamic-range capture with metadata settings and control, and the resulting colour subsampling works very well.

12-bits will provide you enough room to store colour precision and colour difference for the blue screen – opposite the common 8-bit of consumer cameras that simply cannot do this job. The result was an easy-to-handle BRAV file self-containing its metadata – extremely efficient for DaVinci Resolve. During the process of compositing, I could easily equalise the blue screen at such an amount of detail that I was able to extract the pattern of the polyester fabric! I cannot imagine how good the results would have been if the blue screen was perfectly even. Very impressive for a 'pocket' camera, and definitely 'guerrilla VFX' proof.



01b



01c



## 02 CAMERA TRACKING ACCURACY

Another common task in VFX is 'Match Move' – allowing you a virtual replica of the physical camera inside the software that can be used for many purposes, especially rendering CGI assets.

For camera tracking you need pixel precision, so resolution is your ally. Always track at the maximum resolution; even if your project will be finished in 4K, track in the gorgeous 6K available on this camera, and then render at UHD 4K that is proportional to the original 6K aspect ratio. The only inconvenience you will find if your camera is handheld or moving very fast is the trapezoidal distortion of the rolling shutter. There are plenty of plug-ins on the market to correct this distortion of the image before tracking the camera.

Things to keep in mind when you are tracking the camera are the sensor size (the Pocket Cinema Camera 6K Pro is 23.10mm x 12.99mm), the focal length of the lenses you used to shoot the scene, and I would recommend shooting a Lens Grid to calibrate the distortion of the lenses.

Note that the motion blur could make this process very tedious. So if you want to have less motion blur, simply use a faster shutter speed (or narrower shutter angle), then compensate with more light on set if you can, or increase the ISO (not recommended because you introduce more grain that is equally disturbing for this process).

## 03 ACES COLOUR MANAGEMENT

To make the most of colour, you need to manage it effectively. The good news is that DaVinci Resolve supports ACES and using it is a simple process:

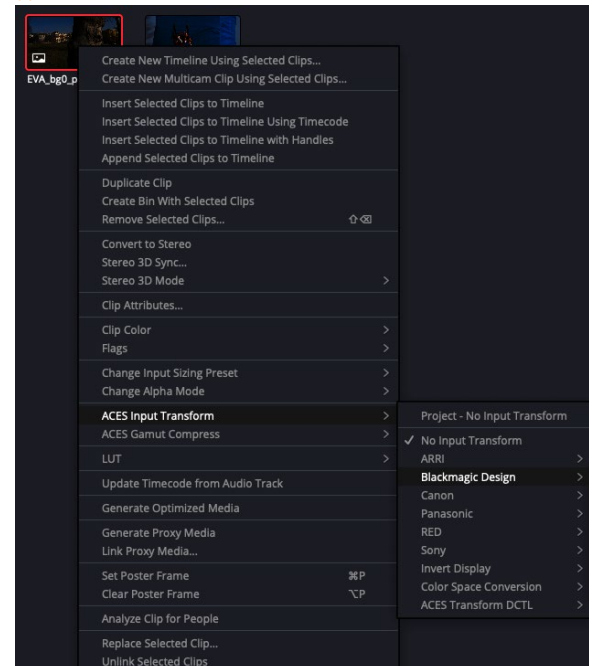
**03.1.** Firstly, adjust your Project Settings. In the Color Management section, select the Color Science: ACEScct and the latest version of ACES available (keep in mind everybody involved in a project needs to use the same version of ACES). For the ACES Output Device Transform (ODT), use the colour space of the display you are using to work, usually Rec.709 for SDR, or P3-D65 ST2084 (1000 nits) with ACES Mid Gray Luminance at 15.00 nits for HDR.

**03.2.** When you are importing your clips into the Media Pool, Resolve should interpret the RAW clips using 'ACES Input Transform' (aka IDT). For non-RAW formats (i.e. ProRes), just right-click on the clip (in the Media Pool) and go to ACES Input Transform and select the right format from the list.

**03.3.** You can export intermediate files (rendering) to work with third-party software. You should really do this on the ungraded master and you want to use the ACES Compliant way to exchange footage, which is just a specific setup for rendering EXR file sequences. First, reset the ACES Output Device Transform of the



03.1

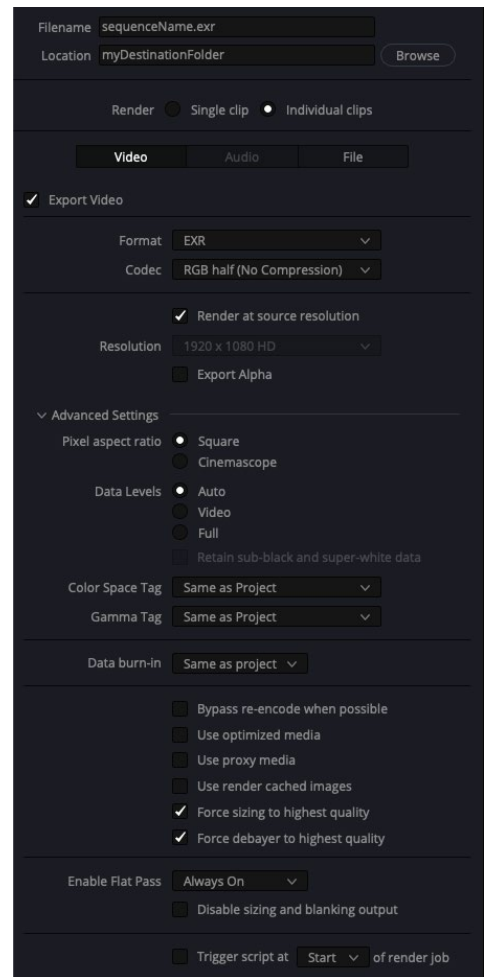
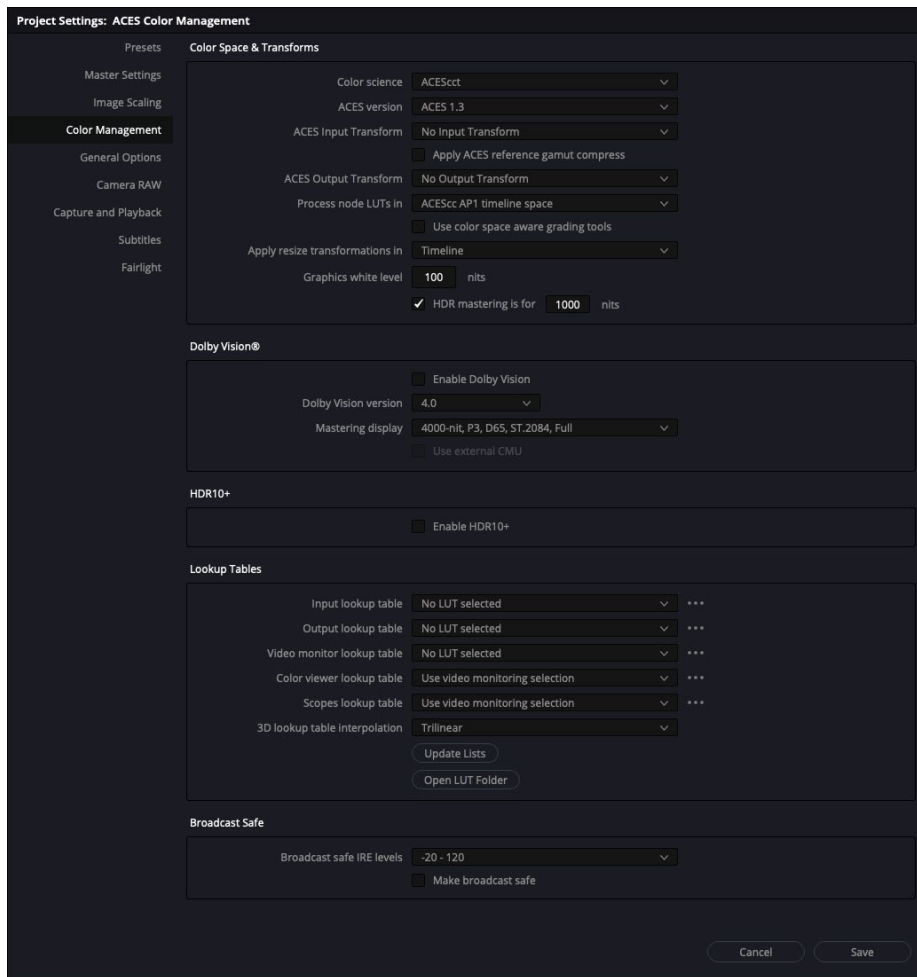


03.2



Camera Tracking | Test Cones (100 cm tall reference) | Max Per Frame Error: 0.1894





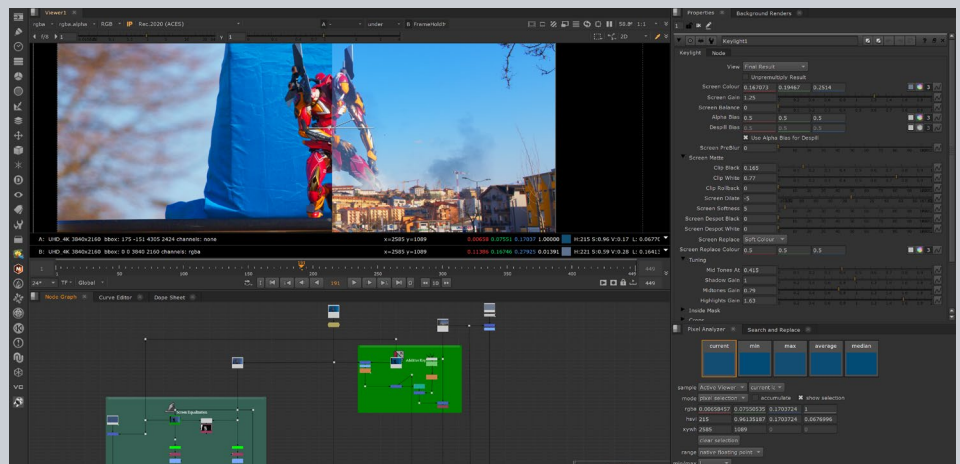
03.3

➤ Color Management tab to 'No Output Transform'. This will allow you to export the Master ACES AP0 primaries (ACES2065-1 colour space).

03.4. Lastly, on the Render page of Resolve, customise your renders as follows: Render – Individual Clips; File Type – EXR; Codec – RGB half (No Compression); Enable Flat Pass – Always On (to ensure you are not applying any grade over the clips you are exporting). Something that might improve your results is selecting 'Force debayer to highest quality'. Other parameters you can change as you need are, for instance, the resolution (I would recommend this for the final delivery resolution for the VFX, and maybe the full 6K if you are intending to track the camera).

Render and collect your folders with the ACES Compliant EXR file sequences in your destination drive. For more detailed and precise information about ACES colour management, please visit [acescentral.com](http://acescentral.com).

03.4



## 04 INTEGRATE PROXIES IN YOUR WORKFLOW

This camera has such a high resolution that sometimes working at the full format for certain tasks, or simply for playback, might not be necessary and it will just make your system slower.

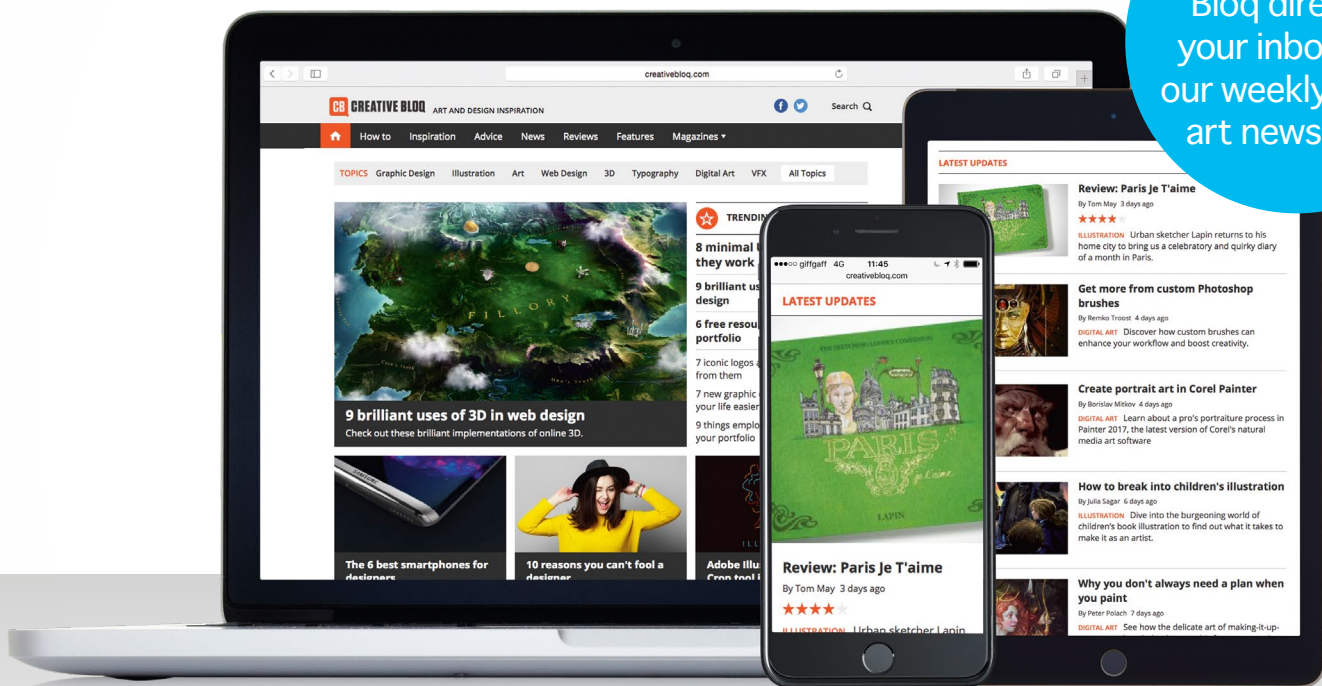
I would recommend you also export a set of proxies with your intermediate renders. Proxies are the same image as stored in the full format but with half the resolution (or even lower ratios, like a quarter). It will offer good playback capabilities and an efficient way to allow the software to load and store plenty of information. Resolve is very smart and creates its own proxies behind the hood, storing it in the cache so you don't feel any lag in the playback rates.

Use the same naming convention for the proxies, but add a suffix \_p0 at the end of the filename for half-resolution proxies, \_p1 for a quarter of the resolution, and so on. •



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#### REAL-TIME COMPOSITING

Use AR compositing to take this 3D model of a piano (above) into the real world (below)



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## REALITY ENGINE

# A BEGINNER'S GUIDE TO AR COMPOSITING

Learn how to seamlessly match the physical world and virtual graphics with Reality Engine's intuitive AR pipeline



**AUTHOR**

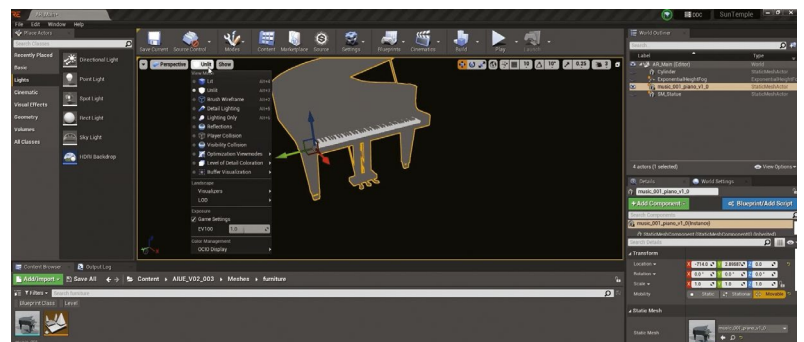
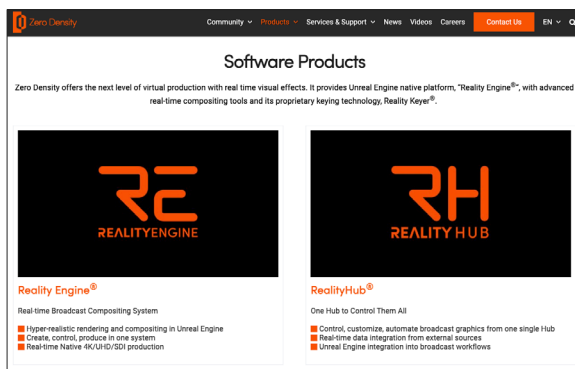
**Faraz Qayyum**

Faraz is a technical artist at Zero Density specialising in developing real-time graphic designs for virtual studio broadcasts. He is also an Unreal Authorized Instructor for Epic Games. [zerodensity.tv](http://zerodensity.tv)

If you're interested in augmented reality, Zero Density's free software, Reality Engine, is an excellent place to start. The Unreal Engine-native platform includes a real-time compositing system and its proprietary keying technology, Reality Keyer. Needless to say, it's a pretty handy tool if you want to composite your 3D visuals on top of footage in real time.

In this tutorial, we'll take you through a quick AR compositing setup in Reality Engine and reveal how it can be used to create photorealistic, real-time composites by seamlessly matching the physical world with virtual graphics. Shadows and lights are crucial to a convincing comp, and we'll help you to gain full control of these without using any

additional cameras or rendering overhead. For this particular scene, I'm compositing a CG piano with incoming video from a studio camera. I'll start with the basic setup of a scene and the node graph, before moving on to the projection setup. Then, I'll teach you how to add virtual lights and shadows to add more realism to your comp.

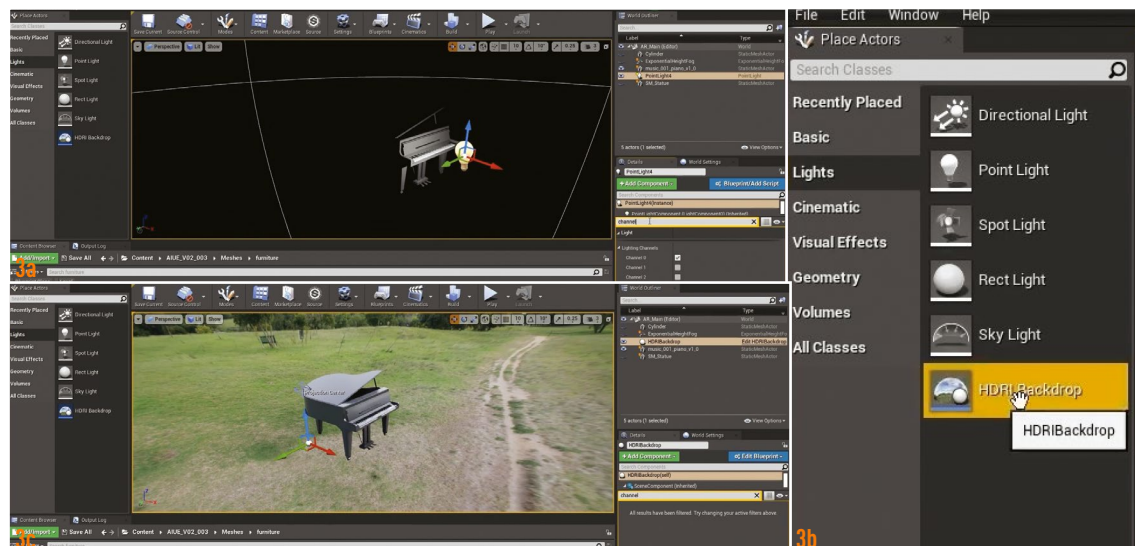


## 01 DOWNLOAD REALITY ENGINE FOR FREE

Let's start with the basic scene setup for your AR scene. First, head over to Zero Density's website at [zerodensity.tv](http://zerodensity.tv) and download the free Community Edition of Reality Engine.

## 02 SET UP YOUR SCENE

Once you've downloaded the software, open Reality Editor and import your 3D model. In this case, I'm using a piano model that has already had reflective material applied. If you prefer, you can also add lights here by using the Place Actors>Lights menu, but to get maximum control I'm going to add these lights directly from the node graph in RealityHub later.



## 03 GET AMBIENT REFLECTIONS

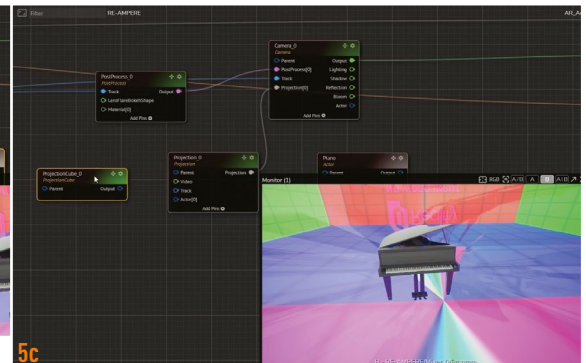
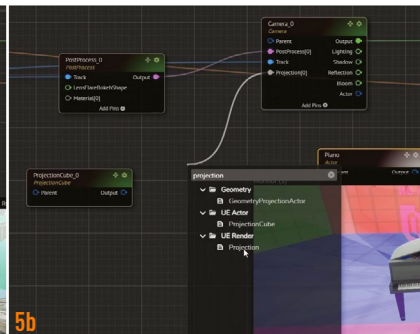
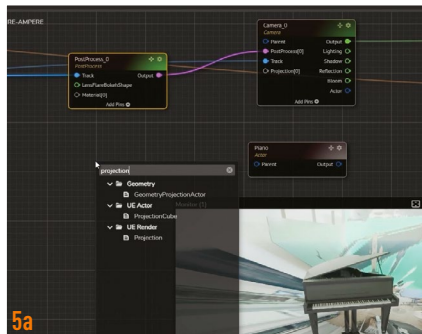
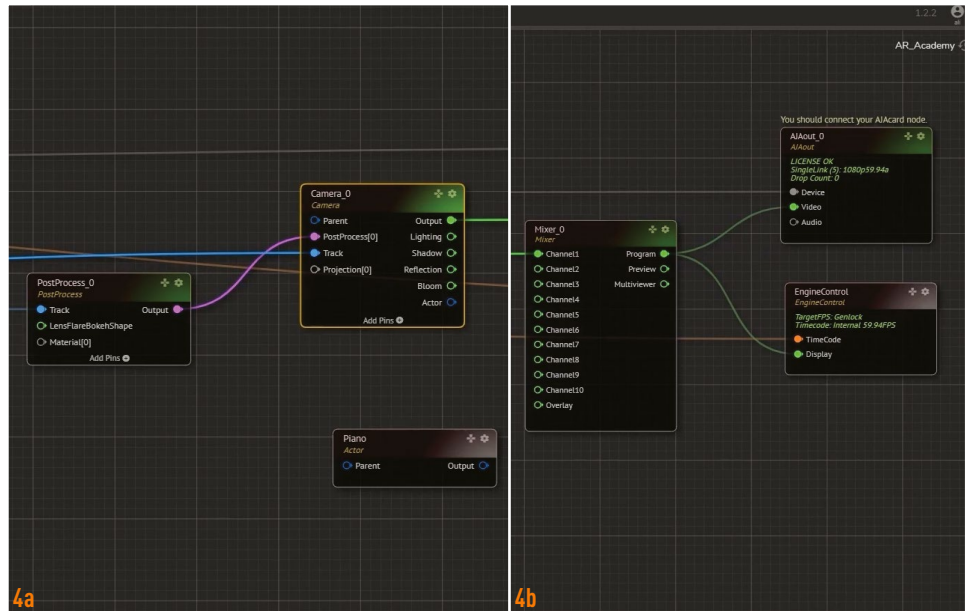
Next, we need to add a backdrop to ensure the reflections on our 3D object look realistic. I've decided to use an HDRi backdrop captured from my studio environment. This means I'll get some nice ambient reflections that perfectly imitate the ones in my physical studio. To do this, click on the Place Actors>Lights>HDRi Backdrop option.



## 04 ADD YOUR LIVE CAMERA FEED AND TRACKING DATA NODES

Now go to the Nodegraph/Actions tab and create a basic AR compositing setup, as seen in the screenshots on the right. As you can see, my Camera node is receiving tracked data from the tracking node, which is pre-configured. Also, the Camera node's output is connected to the Channel1 input of the Mixer node, which lets me preview my virtual scene output.

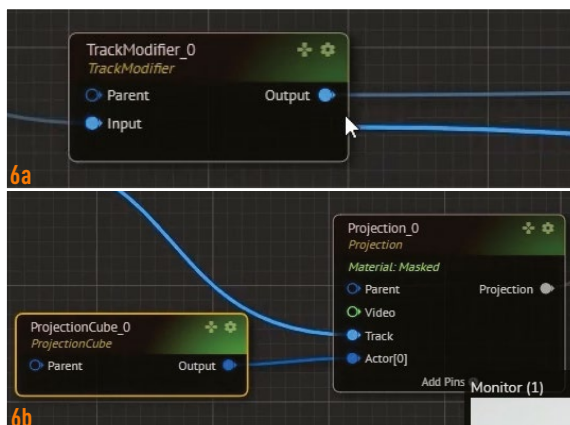
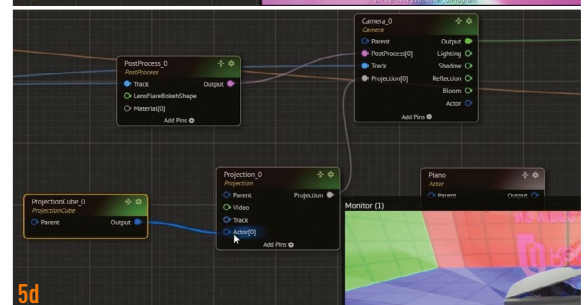
Let's monitor the SDI output on Channel A, and the virtual camera output on Channel B of the Advance Preview Monitor to make sure that the virtual and physical worlds are aligned. If you need to tweak transformation, simply select your Piano node and use the Transform property to align it correctly to the physical studio environment.



## 05 PROJECTION SETUP

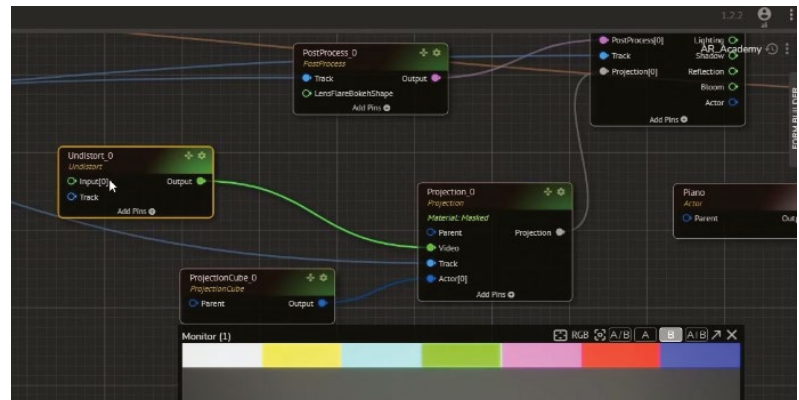
Now, let's add the ProjectionCube node to our node graph by right-clicking on any empty area, then opening up the System Nodes menu and typing 'ProjectionCube'. Next, open up the System Nodes menu again and add a Projection node into the scene. The ProjectionCube will receive Undistorted SDI Signal from the physical camera.

Now, make sure you connect your ProjectionCube output to the Actor input of the Projection node. Finally, connect the Projection output of the Projection node to the Projection input of the Camera node. Once you're done, your node graph should look like mine does in the screenshots 5c and 5d.



## 06 ADD TRACKING DATA TO YOUR PROJECTION NODE

The Projection node also requires tracking data from the tracking node. To do this, connect the Output of your tracking node to the Track input of your Projection node.



## 07 ADD YOUR SDI OUTPUT TO THE PROJECTION SETUP

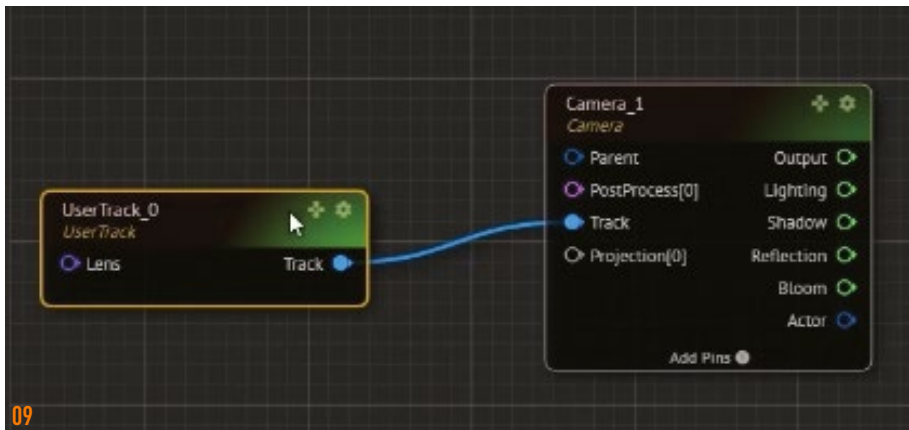
Now the projection setup is ready to receive undistorted video input from your physical studio camera. To add this, bring up the System Nodes menu and search for 'Undistort', then add the node into your Rgraph. Make sure you connect the Undistort node output to the Projection Video input, as seen in my screenshot above.





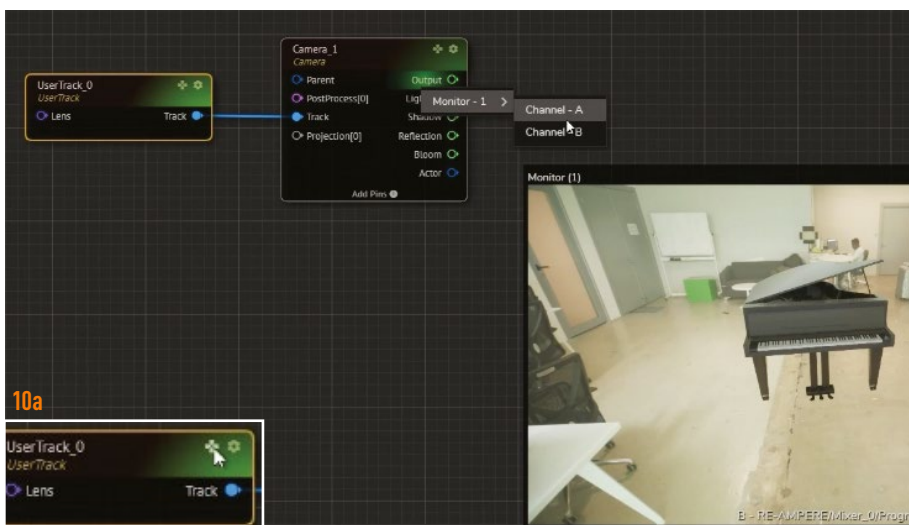
## 08 CONNECT YOUR SDI FEED TO THE UNDISTORT NODE

Remember that the Undistort node requires two inputs. Make sure you connect the Undistort node input to the output from your physical camera and the output from your tracking node.



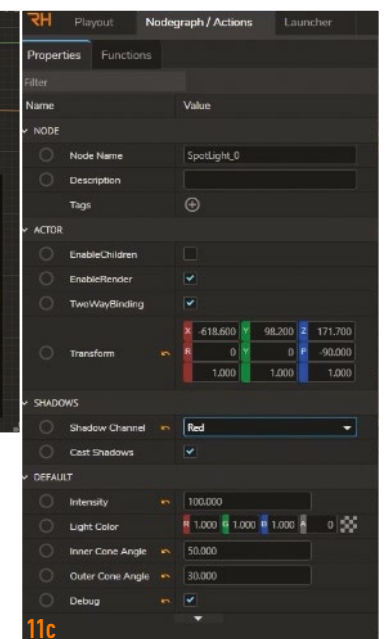
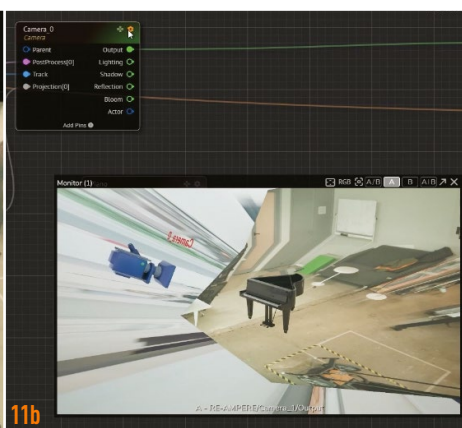
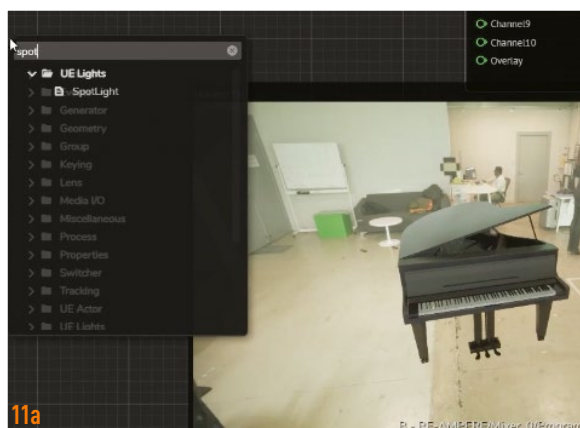
## 09 CHECK YOUR SETUP FROM ANOTHER PERSPECTIVE

Now we need to check our projection setup from a different perspective. This lets us align the ProjectionCube to the physical environment as closely as possible, so all reflective materials catch the correct reflections, and the physical environment can receive the correct virtual shadows. To do this, bring up the System Nodes menu and add a Camera node to your node graph. Do the same again, but this time add a UserTrack node. Connect the Track output of the UserTrack node to the Track input of the Camera node, as seen in my screenshot above.



## 10 PREVIEW YOUR CAMERA OUTPUT

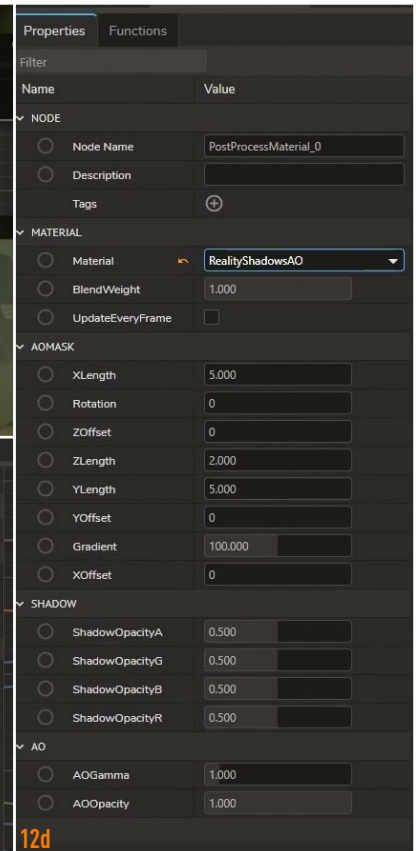
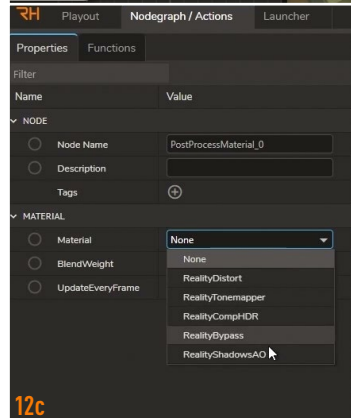
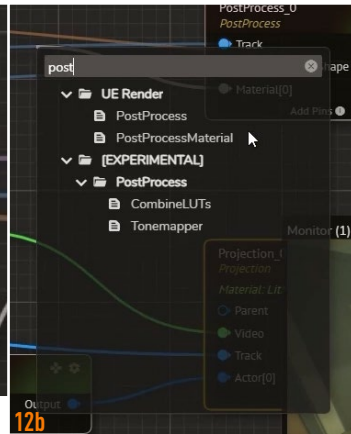
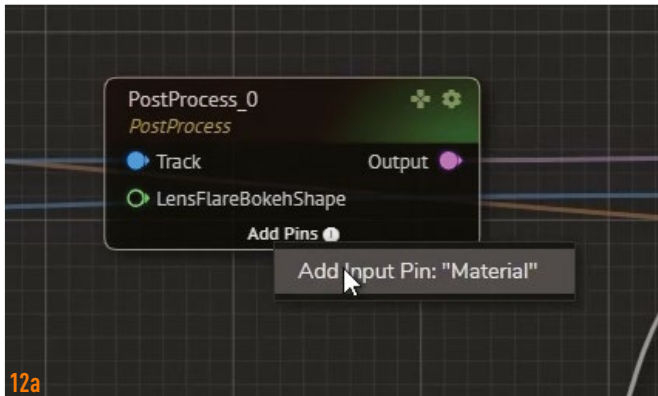
Now preview the camera output by right-clicking on the output of the Camera node, then selecting Channel B. Click on the gamepad icon (Image 10a) of the UserTrack node to move around the scene, and click the debug icon on the Tracked Camera node to see the tracked camera inside the scene.



## 11 SET UP VIRTUAL LIGHTS AND SHADOWS

At this point, we can start working on lights and shadows. Start by right-clicking the background of the node graph to bring up the System Nodes menu, then add a Spotlight (Image 11a). Turn on the debug mode (Image 11b), which will help you to position the light correctly in the scene. Use the Properties panel on the left to adjust a few of the light parameters and select one of the available ZD shadow channels at this stage to test how your scene will look (Image 11c).

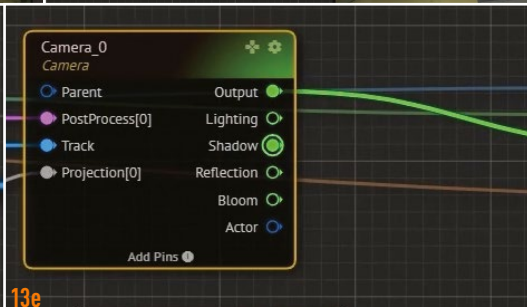
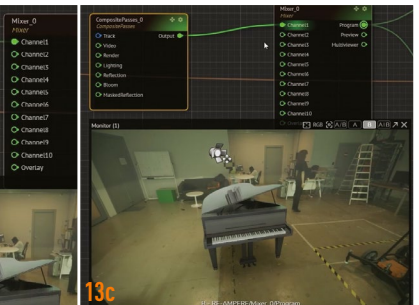
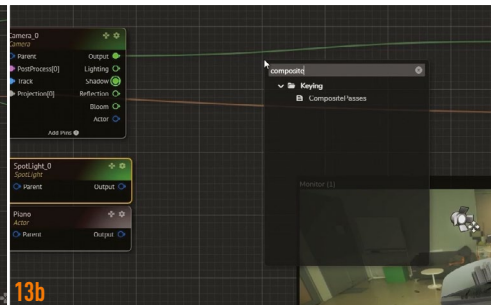
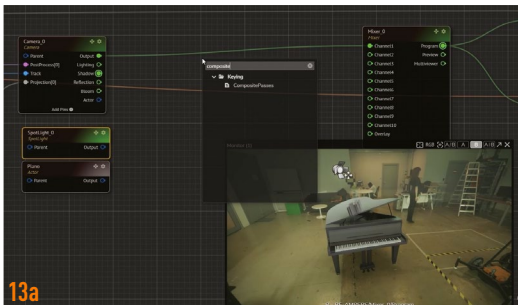




## 12 MASTER THE SHADOWS

In order to see and control the shadows, we next have to change the projection material preset from Masked to LitMasked. To do this, select your Projection node and use the Material dropdown in the Properties panel on the left to switch your material from Masked to LitMasked.

Next, add an input to the PostProcess node (Image 12a) for Custom Postprocess Material, and connect it to a new PostProcessMaterial. To do so, add the new PostProcessMaterial to the scene using the System Nodes menu (Image 12b). Now, select the newly added PostProcessMaterial node, and from the Properties menu on the left select the RealityShadowsAO material preset to add shadows to your scene (Images 12c and d).



## 13 BRING IT TOGETHER

Now it's time to begin compositing everything into your scene with the help of the CompositePasses node. Right-click the backdrop of your node graph to bring up the System Nodes menu, then search for the CompositePasses node (Image 13a and 13b).

This node requires tracking data from the tracking node and video input from the physical camera, as well as the virtual scene render, shadows, bloom and reflections from the virtual camera. Connect the CompositePasses output to Channel1 of your Mixer node (Image 13c), then connect the CompositePasses Track input to the output of the TrackModifier node (Image 13d).

Now, connect the CompositePasses Video input to the output of your Delay node, and the CompositePasses Render input to the output of your Camera node (Image 13e). Finally, connect

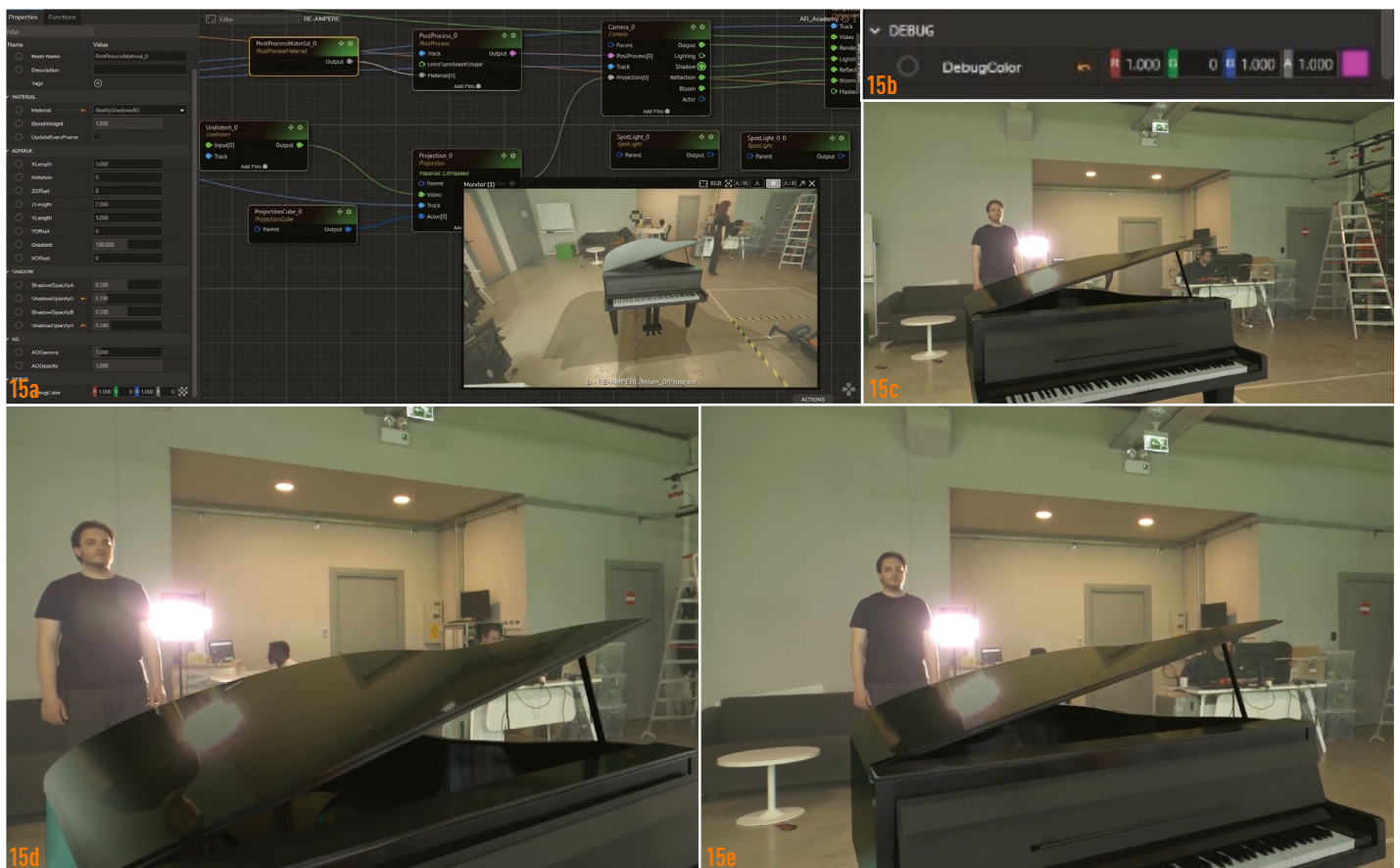
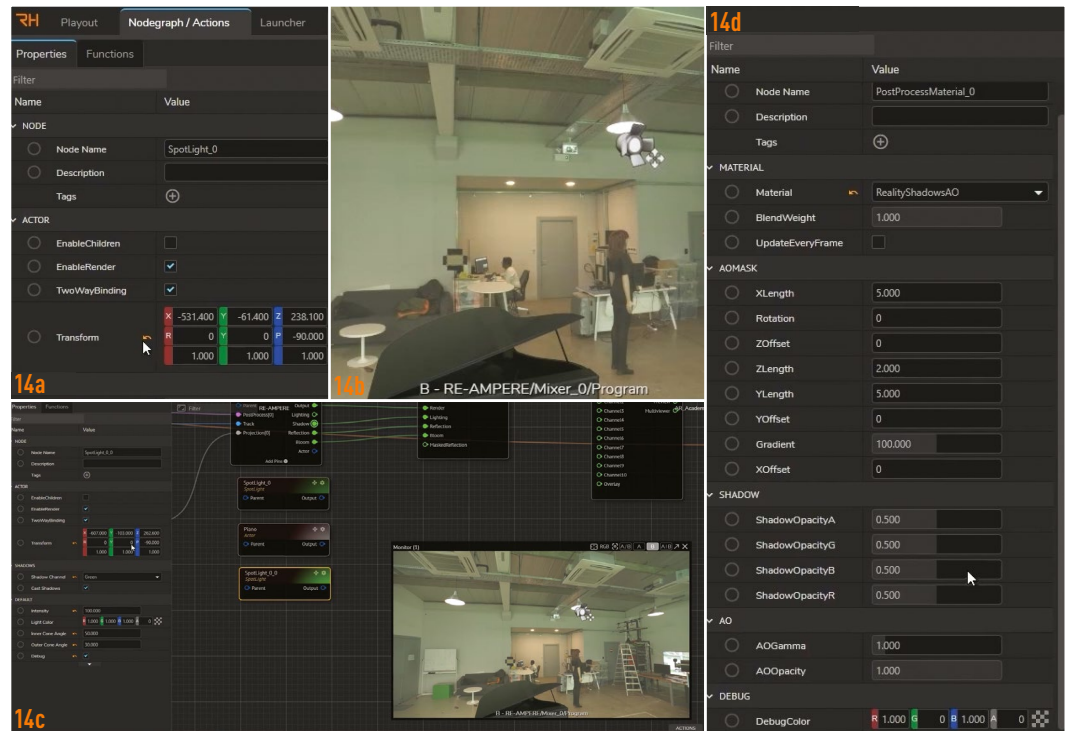
your Camera Shadow output to the Lighting input of your CompositePasses node, and the Reflection output from your Camera to the Reflection input of your CompositePasses node (Image 13f). You can even observe the changes happening in your scene while you connect all the pins together.



## 14 MATCH YOUR LIGHTS

In order to achieve believable results, we now have to match the virtual world to the physical one as closely as possible. Do this by selecting your SpotLight node, then changing the Transform values in the Properties panel. Your goal is to move the virtual spotlight so that it closely matches your physical lights on set. Add new SpotLight nodes to your scene to keep matching your physical lights with virtual ones; don't forget to select individual shadow channels for each light.

Now select your PostProcessMaterial node and change the ShadowOpacity in the Properties panel to match the other real shadows in your scene (Image 14d).



## 15 MAKE IT REAL

To make this composite even more realistic, we need to control ambient occlusion. This adds richer and more realistic results to the final comp, adding more depth to an otherwise flat image. This is hugely important for AR, especially when you want to place your 3D graphics closer to each other or to physical surfaces like the floor. Turn on the debug mode on your PostProcessMaterial node, and change the Alpha of the DebugColor in your PostProcessMaterial Properties to 1,000. It should now turn a hot pink (Image 15b).

Next, change the parameters of the AOMASK option under the Properties menu, as in the screenshot (Image 15a). This adds an additional control that helps to mask a user-defined area for the ambient occlusion. You can also see without any additional steps that the piano is able to receive the realistic reflections from a physical studio. You should now have a great realistic comp to begin working from for your augmented reality project! Depending on your scene, you could now work on reflections or further lights and shadows: the choice is yours (Images 15c, d, e).



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# MAKE A DETAILED FOREST SCENE

Learn how to build an environment from scratch with this guide from Goodbye Kansas artist **Jesper Bardhamre**

**E**ver since I was a boy I have always been fascinated by gnomes. According to Swedish folklore, our gnomes acted as guardians for both people and animals. This particular gnome is of the forest variety and as such he took care of both flora and fauna in his allotted area. Common tasks included

taking care of hurt animals and warning of approaching dangers.

This image is a promotional picture for a game I would like to develop in the future. My intention with the scene is to give the viewer a glimpse of the story I wish to tell in the game, and also serve as a benchmark for the quality I aim to achieve. The project

was also a personal practice piece, since it was a long time since I had done any rigging or grooming.

In this quick tutorial I will write about the creation process of making a highly detailed forest scene. I will also discuss some terminology and workflows that I use professionally as an environment artist.

## 01 ASSET CREATION

I knew from the start that I wanted to rely as much as possible on scanned assets from Megascans. After looking through their library, I could see that I had most of the assets I needed for the scene, except for two plants that are very common in a Nordic forest: blueberries and lingonberries.

I painstakingly created a few variants of these bushes within Maya, textured them in Substance Painter and shaded in V-Ray. A tip to achieve a higher level of realism is to model the leaves with thickness. By doing this, you can use a Sub Surface Scattering shader on them, which really helps to sell their translucent properties.

## 02 MODEL THE CHARACTER

Before doing any 3D work I started with some quick analogue sketches. I find it important to have a solid design idea before starting to push polys around on a complicated model such as this one.

The first step was to block out the character in Maya. At this stage I only focused on getting the proportions right and ignored any detail work. When done I separately imported them into ZBrush.



01





**AUTHOR**

**Jesper Bardhamre**  
Jesper is a 3D artist hailing from Sweden. He has been in the industry for more than 15 years and is currently employed as an environment artist at Goodbye Kansas Studios.  
[jesperbardhamre.se](https://jesperbardhamre.se)



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➤ Inside ZBrush I did all of the detail work. I added folds to the clothes, wrinkles to the skin and ornaments to his equipment. The high-poly mesh was then brought back to Maya, retopologised and UV mapped. Lastly I reprojected the sculpt on the clean mesh.

## 03 LOOK DEVELOPMENT

After I had finished the retopology I exported displacement and normal maps from ZBrush. The displacement maps would later be used when shading, and the normal maps were used in Substance Painter to get a good representation of the high-poly version.

I relied heavily on textures from Quixel since they are of very high quality and also PBR-calibrated. On top of these textures I used both procedural and painted weathering.

The shading was done in V-Ray and kept fairly simple. For the skin I used the alSurface shader, which produces a nice SSS effect without being too heavy to render.

## 04 GROOM THE GNOME

This was by far the most annoying step for me and the reason for this was XGen. On numerous occasions I experienced corrupted files which meant that I had to redo my work from scratch. This might of course have been caused by inexperience from my side, but it's always very scary to work with software that might produce files that don't open the next day.

But apart from the issues above, the software was easy to use and produced nice results. You start by placing guide curves to define the length and flow of the groom. Next you typically add masks to define where the hairs should grow and lastly apply various procedural modifiers like noise and clumping. A general tip when doing grooming on a character like this one is to split the groom into separate objects. In the case of my gnome I divided the beard, the eyebrows and the hair on the back of the head into separate hair systems.

## 05 RIG THE MODEL

To rig I used a plugin called Advanced Skeleton. The system is divided into a few chronological steps. You start by cleaning your



02

model and name things according to the AS standard. Next you import a pre-made skeleton that you fit to your character. Within a couple of seconds after pressing the 'magic button', the skeleton is mirrored and has controls attached. Very nice indeed! After this you 'only' need to skin your character before trying out some funky poses or animating it.

If you want to try this plugin I recommend that you watch the AS tutorial by Joshua Jones on YouTube. It will guide you through the entire process of rigging your character's body and face.

## 06 LAYOUT

My general approach when doing a complex environment is to start with the bigger chunks and then iteratively add smaller pieces and details. With this image I started the process by searching for a nice-looking ground in the Quixel library. To make the ground a bit crisper I scaled it down to approximately half its real size.

When all major elements were in place I proceeded to add the bushes. To make the scene less memory-heavy I chose to do this with V-Ray proxies. First you convert a mesh to a V-Ray proxy and save it. [Note that the geometry needs to combine to one piece. It does not matter if this turns the shaders into face assignments.] This creates a lightweight proxy mesh that is used when manipulating the proxy in the viewport AND a high-res mesh that is loaded automatically when you render the scene.



03



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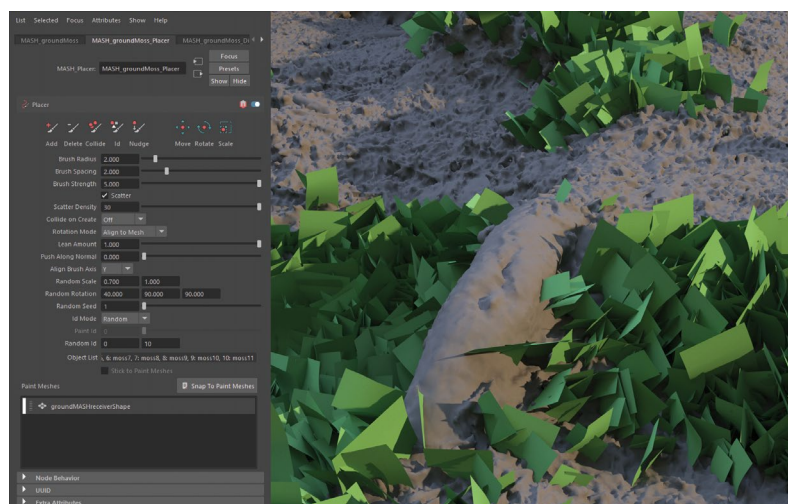


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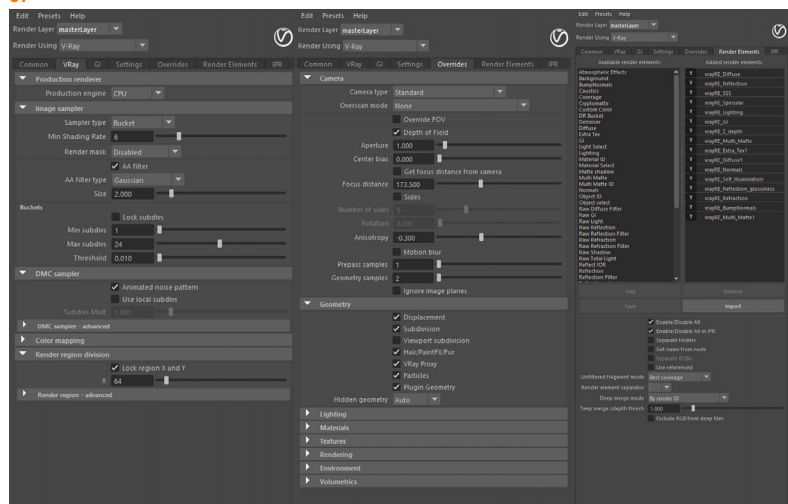


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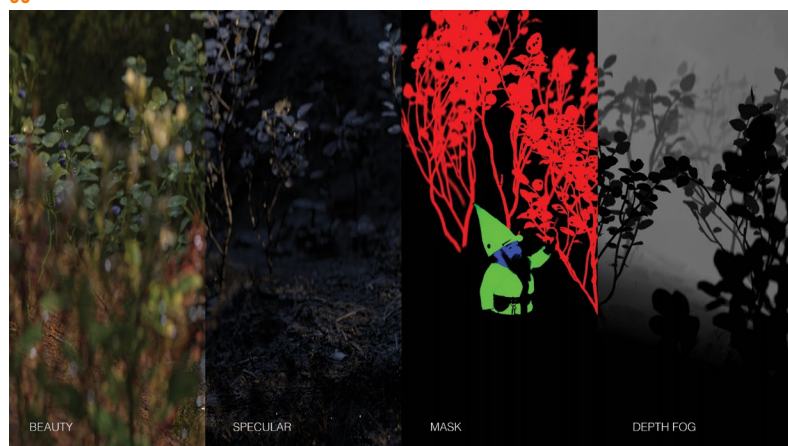




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By using these proxies as instances, the memory footprint gets a lot smaller since V-Ray only needs to read the data for one bush instead of several unique ones. To put this in perspective, I could have easily added thousands of bushes in the scene without slowing down the viewport or using huge amounts of memory when rendering, compared to using unique geo for them.

To create an instance in Maya, choose the parent object and open the Duplicate Special Options. Change Geometry type to Instance, define how many copies you want, and then press Duplicate Special.

## 07 SCATTERING

The tool I used for this stage is called Placer, which is available through a plugin called MASH inside Maya. With this tool you can

use a brush to place geometry and also add various random attributes to each instance. I can highly recommend it since it's easy to set up and is very stable.

The objects I scattered in the scene are the moss and the water droplets. For the moss I used some very simple bent planes, which proved to be an effective and lightweight method. A tip to make the tool perform better is to create a low-res proxy for the Paint Mesh (the mesh or meshes that you 'paint' on). I did this for the ground and it made the experience a lot less laggy.

## 08 RENDER WITH V-RAY

As stated before, I used V-Ray as my rendering engine. I used an HDRI with a forest scene for the overall lighting and sphere light for the sun. For the GI, I used Brute Force/Light Cache with the standard settings.

As usual when I render I like to use 3D depth of field. This always looks better compared to doing it in compositing, and you don't have to worry about edge artefacts. To give the depth of field a more cinematic look I chose to render it with an anisotropic value of -0.300. This created the egg-like 'bokeh balls', which to me looked way cooler than spherical ones.

## 09 COMPOSITING

The first thing I did in the compositing stage was to remove some fireflies in the specular pass. [Fireflies are noise that appear in the specular highlights. They generally appear in areas with high glossiness that are hit by strong and small light sources.] I did this with the Clone Stamp in Photoshop.

When I had a 'clean canvas' to work on, I did various colour tweaks such as dodge/burn and some vignetting. To produce the star-shaped highlights I exported the specular pass to Fusion and used the Highlight filter.

I then did some colour grading with the Camera Raw filter in Photoshop. Lastly I used the Lens Correction filter to add some chromatic aberration. This gave the image a softer, more realistic look with a subtle mismatch between the three colour channels. •

## Foreground, midground and background

Separation and depth in an image is usually desirable. To achieve this, I divided the scene into three distinct 'levels'. The green area is the midground, and this is likely where your eyes land first. In red we have the foreground, which is placed there to give depth and a dreamy feeling to the composition. Farthest back in blue, we have the background, with the main objective to provide a calm 'wall' to counteract everything that's happening in front of it.



# Artist Q&A

Practical tips and tutorials from  
pro artists to improve  
your CG skills



## Glen Southern

Glen runs SouthernGFX, a small Cheshire-based studio specialising in character and creature design. He has been using and training ZBrush in the UK for over 15 years.  
[youtube.com/c/SouthernGFX/videos](https://youtube.com/c/SouthernGFX/videos)



## Mike Griggs

Mike Griggs is a digital content creator with over two decades of experience creating VFX and CGI for a wide range of clients.  
[www.creativebloke.com](http://www.creativebloke.com)



## Antony Ward

Be it game development, rigging or recording in-depth courses for his YouTube channel, Antony boasts experience in most areas of 3D.  
[www.antcgi.com](http://www.antcgi.com)



## Pietro Chiovaro

Pietro is a freelance 3D artist and YouTuber. An expert in the creation of game assets and environments, he shares many of his creations on his channel.  
[www.pietrochiovaro.com](http://www.pietrochiovaro.com)

## GET IN TOUCH

EMAIL YOUR QUESTIONS TO  
[rob.redman@futurenet.com](mailto:rob.redman@futurenet.com)



SOFTWARE: POSEIT 2.0

## ARE THERE ANY GOOD POSING AND REFERENCE TOOLS ON THE IPAD?

Mike Bailey, Whiston



### Glen Southern replies

Everyone needs references when painting, modelling and designing a scene layout. The great masters all had models and props to help construct their paintings. In the digital world we have had Poser and DAZ for decades, both feature-rich programs – the only problem is that in most cases they have only been available on the PC and Mac, and not for iOS or mobile. The iPad is becoming a powerhouse of creation tools and every week we are seeing new and innovative tools popping up; and the one I want to tell you about is Poseit 2.0.

It's a reference and posing tool that gives you a range of mannequins and props, and enables you to manipulate

and use them to construct a scene. This sort of technique is useful for 2D artists, illustrators, painters, sculptors, 3D modellers and a wide range of other creative types. In essence you are given the ability to use an articulated mannequin; there are male, female, stylised, basic old-fashioned reference models (the ones you see in art shops), and even an écorché model which is where you can see the underlying muscle groups. There's even a werewolf!

The models are rigged and you can select each body part and rotate it to create the desired pose you are looking for. It also has a feature called 'sticky feet' that you can activate if your model is





Being able to pause a horse, rider and a werewolf running away is pretty awesome!

interacting with the ground. In 3D we call it IK, or inverse kinematics, and it is really helpful when you want to move a hand and have the arm respond accordingly rather than having to move the shoulder, then bicep, then elbow, then wrist etc. The models are controlled by their root body part which, as in 3D/CG, is the hips. To move them around, simply grab the hips and away you go. Once they are in the correct location and orientation you then start manipulating down the chain.

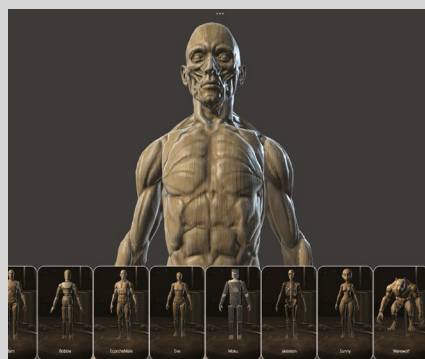
From the hips you move to the abdomen, then the chest, neck, head and so on. You can add multiple models to the scene and build up quite a complex view. Speaking of view, there is also an option to adjust the lighting and the field of view of the camera, which makes it useful for storyboard artists, concept art and even people doing previz layouts. The best part is you can export these as 3D models!

## EXPERT TIP

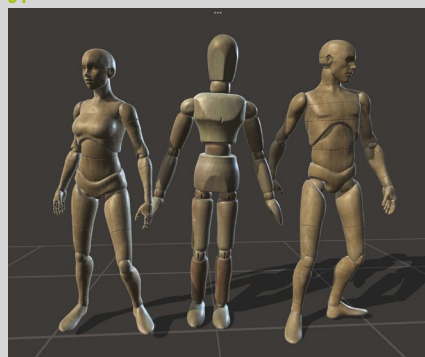
### NOW ADD WEREWOLVES

The great thing about this posing tool is that the developer has given you a wide range of props to add to your scene including guns, a bow, hats, capes, an axe and even a horse! The horse is partially rigged and it has a set of pre-made poses built in so you can make really amazing horse-riding scenes. Don't forget to add your werewolf!

## STEP BY STEP BUILD A SCENE WITH POSEIT



01



03

### 01 CHOOSE YOUR MODEL

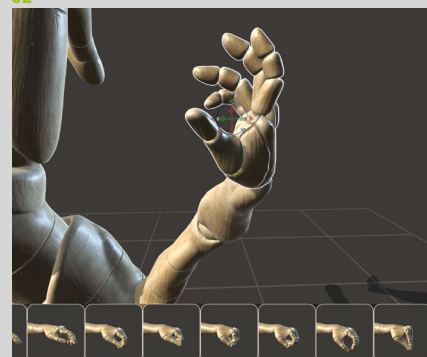
Once you have opened Poseit there is a tool panel on the left. Click the little person icon and you will find a range of models to choose from. Click on the one you want and it is loaded into the scene. Now click on the character's hips and you can use your fingers and pinch gestures to move them around. Moving on the screen with one finger rotates.

### 02 ADD MORE PEOPLE

It is important to start with the hips, as that is the root bone of the whole model. Position that in the correct place and orientation, and then begin to work up or down the body and limbs. If you want a standing character and you want them to interact with the floor, hit the little breadcrumbs icon (top right) and turn on sticky feet. As you move nearer the ground, now the feet will stop and react. (This won't matter if you are doing a flying or jumping figure.)



02



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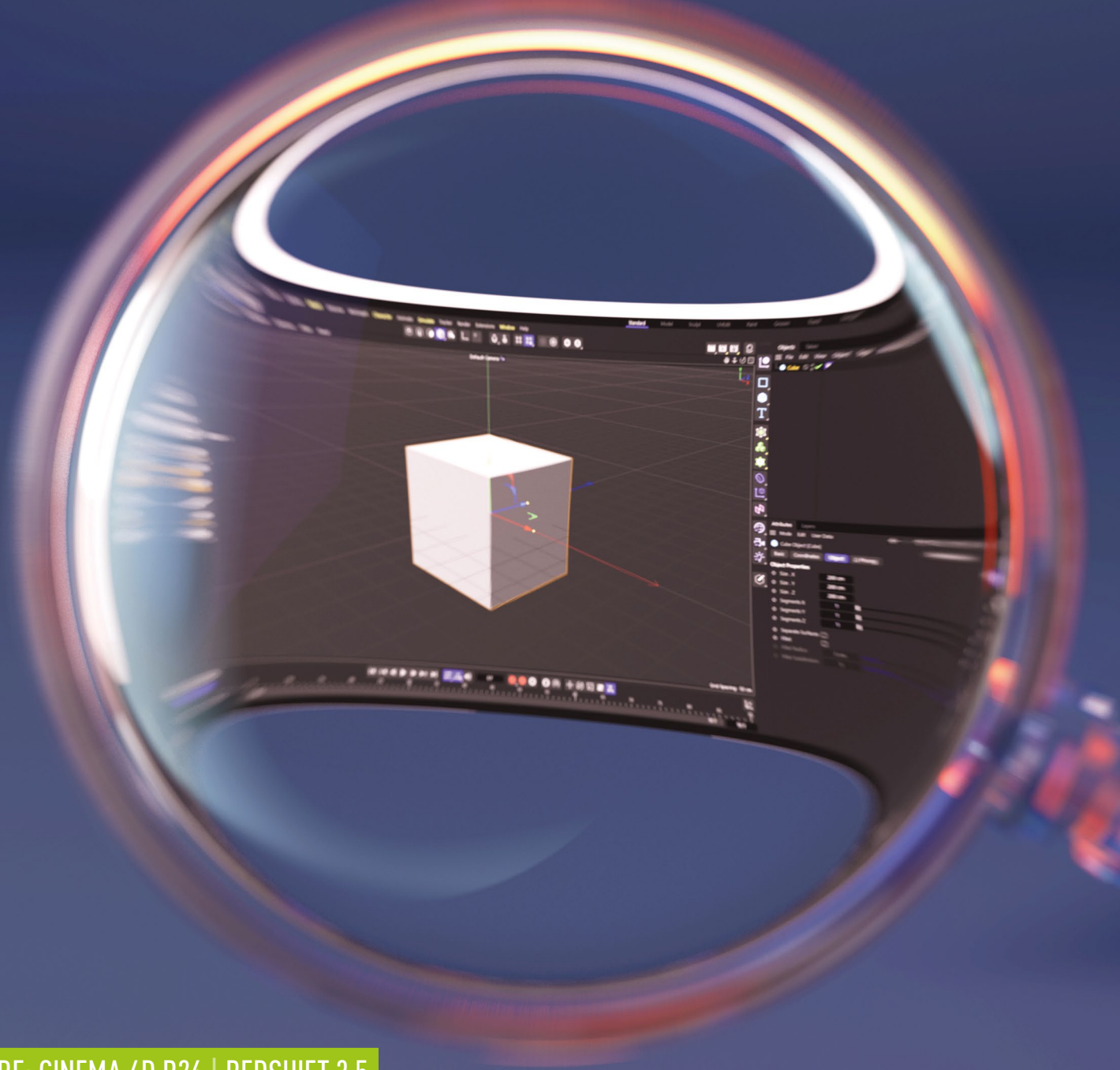
### 03 BUILD UP YOUR SCENE

Do the same process as Step 01 and bring in a new character that suits your scene. Don't forget you can scale them up so huge robots, giants and gods are all easy enough to do! As you are building your scene, you can use the icon on the left panel to adjust the lighting and shadows and also the field of view to get the right camera angle. This is great for close-ups, bird's-eye views or aerial shots depending on the camera settings.

### 04 THIS IS HANDY!

By now you will have an understanding of the basics of Poseit, and it is not a complex tool to learn. Get familiar with rotating and dragging the body parts around. You can also use a wide range of pre-made hand poses. Click on a hand and a slider appears at the bottom of the screen. Slide it left and right and the hand will change pose based on your selection.





SOFTWARE: CINEMA 4D R26 | REDSHIFT 3.5

## WHERE ARE THE REDSHIFT SETTINGS IN CINEMA 4D R26?

*Jonathan Ealing, Dorset*



**Mike Griggs replies**

The recent integration of Redshift into Maxon's Cinema 4D R26 as the default first-party render solution is excellent news for Cinema 4D artists. With its new CPU implementation, which ships with Cinema 4D, as well as continued accelerated GPU support for both Nvidia and AMD graphics cards, it means the future is bright for Cinema 4D users, with a new leaner and more intelligent interface that moulds itself to the needs of the artist.

What happens, though, when the artist has been away from Cinema 4D for a few

years, or they're upgrading and have yet to move to the Maxon system for accessing Redshift shaders and materials?

For many artists, the initial response is, 'Where is Redshift?', before starting a range of panicked Zoom calls to friends and colleagues. The other thing that can happen is that when starting to use Cinema 4D R26, many artists may feel that they *have* to use the new Redshift methodologies, as the previous version's Redshift menus and icons do not appear to be available. Don't worry, everything is still there, but R26 is the release where it

finally makes sense to kick the new tyres and get used to the new system.

This is because Maxon has been pushing to a new Nodal Scene system. While still not 100 per cent a replacement for the standard object system, which has been the mainstay of many artists' workflows for decades, the Nodal Scene system already allows a more extraordinary array of creative options than has ever been possible in Cinema 4D.

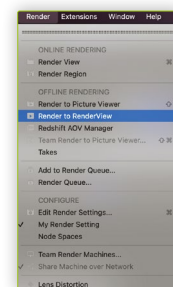
The main thing to realise when adapting to Cinema 4D R26 is that the team at Maxon have not gone out of



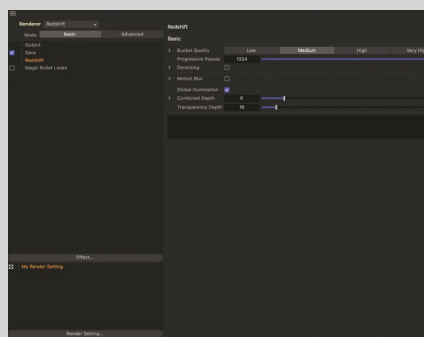
## EXPERT TIP

### ALL THE OLD SETTINGS ARE STILL THERE

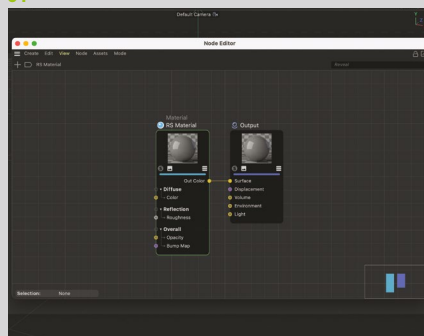
Don't worry if the new way of doing things is causing disruption to an established workflow. Maxon has left the ability to access the Redshift Render View in the Render menu, and in the Cinema 4D preferences, there is an option to switch the 'Redshift' menu back on.



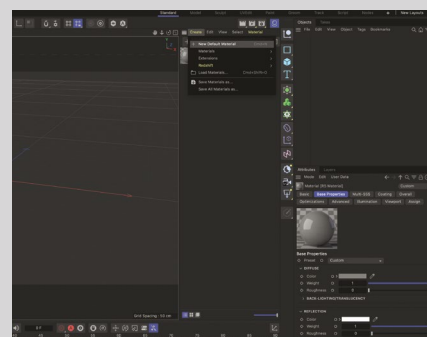
## STEP BY STEP EXPLORE C4D'S REDSHIFT CPU IMPLEMENTATION



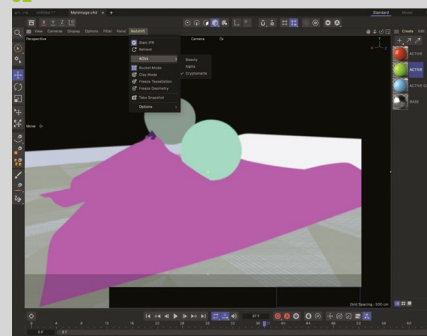
01



02



03



04

Let's take a look at how to adapt to the new Redshift integration in Cinema 4D R26

their way to make things harder. In fact, they have done the exact opposite. For example, setting Redshift as the renderer for a scene means that Cinema 4D R26 now adjusts its selection options for lights, cameras and shaders automatically to be Redshift prioritised. This means that selecting the default Cinema 4D options now accounts for Redshift, rather than the artist having to be aware of the correct process to enable Redshift materials.

This tutorial will highlight some of the key 'gotchas' that have occurred to artists since Cinema 4D R26 was released.

### 01 USE RENDER SETTINGS TO DEFINE THE SCENE

The best way to let Cinema 4D know how you want to use it is to select your chosen renderer for the scene in Render Settings. Choosing Redshift in the 'Renderer' dropdown enables a wide range of options in the Cinema 4D UI, which automatically changes to suit the fact it is now going to be a Redshift scene. For example, adding a light to a scene will default to a Redshift light.

### 02 DEFAULT MATERIAL CHANGE

When Redshift is selected as the renderer for the scene, there's another key point to note. When creating a 'Default Material', that will be a Cinema 4D node-based Redshift Ready Material. This is a much more efficient system than in previous versions, where the artist had to know precisely which type of material they wanted to create, and select it from the appropriate sub-menu in the 'Create' menu in the materials manager.

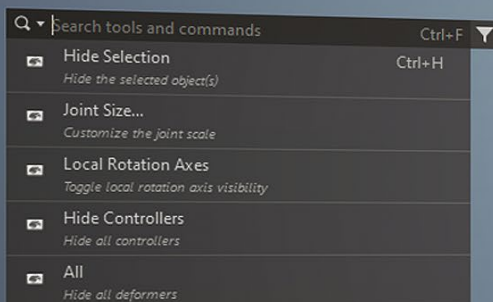
### 03 MAXON REDSHIFT NODES

For artists coming from an earlier version of Cinema 4D, the Redshift Default Material selection may mean that this is the first time they will encounter a Maxon Node Graph, which is different from the now legacy Redshift Shader Graph. The Maxon Node System for Redshift is based within the node workflow that Maxon is developing, and has the quality-of-life improvements such as instant Solo on a node in the Render View when the 'S' symbol is now selected.

### 04 USE THE VIEWPORT FOR RENDER PREVIEWS

The 'Redshift' menu is no longer visible, which means that the traditional Redshift Render View is not easily accessible. That doesn't mean that Redshift can't be previewed, and in fact, it's the exact opposite. Every Cinema 4D viewport now has a 'Redshift' menu, which allows artists to view the scene using Redshift while still interacting directly with the objects.





Autodesk recently added a long sought-after search function to Maya, but did you know that you can do more with it?

## SOFTWARE: MAYA

# HOW DO I USE MAYA'S NEW SEARCH FUNCTION?

Eric Tolan, Berwick-Upon-Tweed



### Antony Ward replies

Since I began using it back in the early 1990s, Maya has grown enormously as Autodesk has continued to add new features and tools. The problem is, accessing these can often involve a search through the ever-growing drop-down menus, which can impact on your workflow.

Marking menus have done a lot to combat this issue, offering users a context-based system giving quick access to the most-used tools for the current situation, all with the press of a key and the click of a button.

These have served us well, and with each release Autodesk streamlines the process. They work particularly well when modelling, meaning you can quickly bevel, extrude or add an edge loop without breaking concentration.

As good as these are, they aren't perfect and for a long time now the Maya community have been asking for one particular feature to be added, one which

other 3D applications have now had for a while. This request has been for a quick search function.

Thankfully, Autodesk has been listening to its community's feedback on this matter, and one of the main features of Maya 2023 is its new search box, which did pop up in later updates to 2022 for those who had access.

On the left of the user interface is a simple magnifying glass button. Clicking on this will open a text box, allowing you to quickly search for a tool or a command. You don't even need to know the name of the tool you are looking for, because Maya will try and work out what you need based on the text you input.

Searching isn't the only function this tool offers. You can also switch the operation so you can search for and select something, which is essential when working on larger scenes. You can also run a MEL or Python command too, all from this one box.

### EXPERT TIP

#### POP-UP SEARCH WINDOW

The search button isn't for everyone. What if, like me, you prefer to work with the user interface hidden, which means you can't easily access it? Well, for quicker access to it you can also press Control and F to bring up a floating window.

If you need to repeat the command you can press G, but the search tool will also remember your previous searches, so you have quick access to them if needed.

So as new features go, it's not groundbreaking, but it could be the one that helps shave precious time off your daily workload.



## SOFTWARE: SUBSTANCE DESIGNER

# HOW CAN I CREATE SEA WAVES USING SUBSTANCE DESIGNER?

Maria Taylor, Madrid



Pietro Chiovaro replies

I will show you how to create sea waves using Substance

Designer, in particular how to generate the Normal and Height textures needed for your material. This material is really simple, but by applying texture in your 3D software the results you can achieve are amazing. In this render, I have recreated the castle of Hogwarts from *Harry Potter*, featuring the water material based on the texture that I generated from Substance Designer. So let's jump into it!

For this type of material, I selected the Physically Based (Metallic/Roughness) Graph Template and deleted the Metallic, Base Color and Roughness outputs of the template, since these are not necessary for this substance.

Next we can start to add the nodes useful for this material, so from the Substance Designer library we just need: the BnW Spots 1 noise, a Levels filter, the Height to Normal World Units filter (or the Normal filter, since this has the same function), and lastly the Blur filter.

Before setting up the nodes and proceeding with the links, we need to make the Height in the viewport visible,

## EXPERT TIP

### MOVING WAVES

Since the images generated in Substance Designer are tiling textures, you can animate the waves by changing the position of the texture coordinate; experiment with the position/keyframe distance to find the best ratio.

as this way it will be easier to see what's going on and have a clear preview while setting up the nodes. To do this, we need to go to the Viewport panel and click on Material>Default>Edit, and in the right-hand panel, increase the scale of the Material Height; I usually set it to 1.

Now it's time to link the filters and generators in the following way:

At the start, we have the BnW Spots 1 noise, which we can link to the Blur filter. Next, link it to the Levels filter. Now we just have to link this Levels filter to the Height Output, and the Normal filter (or Height to Normal World Units) and link this element to the Normal Output. As soon as we link this latest element, we will see an initial preview of the sea waves.

At this point, the only thing we need to do before finishing off is to set a few parameters. First of all, we should decrease the intensity of the Normal and Height Output of the noise texture. To do so we have to change the contrast of the texture, just by decreasing the white point of the Levels filter.

Now the only aspect missing is the intensity of the Blur filter, and here you can choose the type of waves you need – in general, with the intensity set to 1, you have a more complex and 'crispy' sea wave, while a value of 2 or higher makes the waves softer, like a calm sea.

Finally, you now need to just export the two textures and apply them to your water material.

The use of Normal and Height textures helps to improve the performance, decreasing the calculation time and helping the render engine work faster





## ● Technique focus

Create portraits

# Technique focus

Incredible 3D artists take us behind their artwork

### CREATURE PORTRAITS

The most difficult thing for me in this work was to achieve maximum similarity with the concept [by Alexander Shatchin]. At the sculpting stage, I tried to match the details as close as possible. In order to identify discrepancies with the concept, I created a GIF of the image, where the concept switched to the model, and this made it possible to identify and correct those areas that did not match. At the texturing stage, in order to get into the concept as much as possible, I picked up the position of the head in the editor, as in the concept, and I projected it onto the head. After that, I outlined over and finished the missing areas. It also helped to achieve more similarity.



**Pokomeda Andrey**  
[artstation.com/pokomeda](http://artstation.com/pokomeda)

I am a 3D generalist who has been working in the CG industry for more than ten years, now specialising in characters.







**ORC HEAD**  
Software Maya, ZBrush,  
Xgen, Substance Painter  
Year made 2022





# The Hub

News and views from around the international CG community



## INDUSTRY INSIGHT

# On the virtual stage

Sara Gamble, Head of Volumetric Solutions at MRMC, explores how immersive technologies have triggered a revolution in entertainment production

**I**mmersive technologies are changing the way digital content is created and experienced, whether for film, TV, commercials or new media content. Virtual, mixed and augmented reality are being used not only to create spectacular visuals, but also to aid production with cost and time efficiencies, to present more options for creativity, and to bring geographically diverse talent together in a digital world.

Volumetric capture is one of the most exciting new technologies on the map, the myriad uses of which we are just beginning to realise. By capturing a 3D video of a specific moment in time, directors and even viewers can have unprecedented control over the angles they view in – to create a story, drop a character into a different

environment, create interaction between characters shot separately, and much more.

As experts in motion control, broadcast solutions and advanced photography, MRMC has been at the forefront of the development of volumetric capture. In 2019 MRMC began working with Dimension Studio, the developers of a volumetric capture studio in Wimbledon; together they created Polymotion Stage, a mobile studio environment for the production of volumetric video, avatars and stills.

The green-screen studio, onboard an expandable truck, is able to travel across the EU. It houses 106 video cameras – 53 DSLRs and 53 infrared IR cameras that record depth and position in space, placed around the walls, ceiling and floor – plus motion capture and prop tracking equipment, and four overhead mics to record audio as

required. Once captured, the video files are processed to a lightweight 3D video used as an MP4 or OBJ asset.

One of the most high-profile projects to date utilising volumetric capture was the music video for *My Universe* by Coldplay and BTS. This project saw the bands perform ‘together’ within a virtual environment, even though they were geographically split on different continents; Coldplay filmed their performances on the Polymotion Stage truck in the UK while BTS performed at a Microsoft partner studio in Seoul, South Korea with a similar volumetric stage setup. Each band member’s performance was filmed individually, with filming taking less than a day for each band.

When time is limited, volumetric capture gives creative teams many more options





**Above:** Coldplay and BTS perform together in the *My Universe* video



**Left:** Sir David Attenborough was filmed in 4k in the Polymotion Stage for London's Green Planet AR Experience, in which he appeared as a hologram taking users on an immersive journey across digitally enhanced worlds

to capture talent at the time and make creative decisions later about where and how the talent will appear within a virtual environment. In a standard shoot, those decisions have to be made there and then, to ensure enough angles are captured and to avoid expensive re-shoots.

Time can also be saved for the talent by being able to bring the Polymotion Stage to wherever they are – and, with planning, the investment could be further maximised by filming performances for multiple projects in the same session. For example, rather than travelling to three different locations to shoot music videos, a singer could perform three songs in one or two days and later be dropped into those virtual locations for the videos. They could also film assets for later use in promotions, advertising, social media and fan experiences.

The most exciting aspect for creatives, though, is the ability to go into a shoot knowing what they want, but also having the ability to change their vision – giving them freedom they have never had before with linear video. While there was of course a script and storyboard for the *My Universe* video, each band member's 3D asset could be placed anywhere in the virtual environment. Now imagine if you wanted to create a new view, change the scenery or another idea came to mind post-capture; the 3D asset could be moved to a different location, or rotated

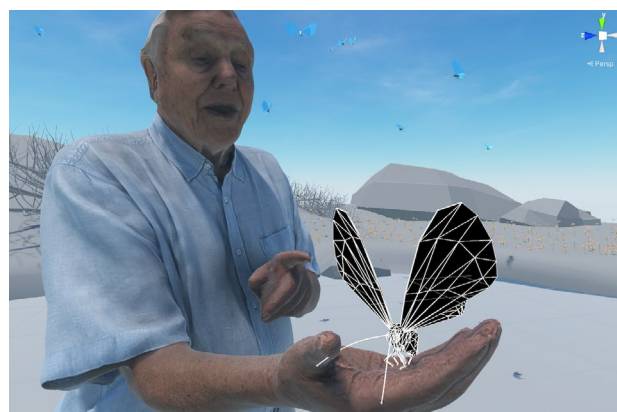
to be seen from a different angle through the virtual environments. There is no such thing as looking in the 'wrong' direction,

as the talent's placement within the environment and the viewing angle can be changed. Captured assets can be moved around and can even be shown to interact virtually with each other by matching eyelines and placement within the environment.

The Polymotion Stage also allows for the capture of props in motion, such as drumsticks. In the case of the *My Universe* video, it shot at 360fps to ensure that the

## "THE TRAVELLING STUDIO HOUSES 106 VIDEO CAMERAS"





My Universe / Green Planet Experience images © MRMC and Dimension Studio

➤ sticks were accurately synced with the beat of the music. This is a huge time saver to be able to film a performance and motion capture in the same session.

Volumetric capture also provides opportunities to repurpose the 3D assets, thus adding more value. Coldplay performed *My Universe* live on The Graham Norton Show, with the 3D assets of BTS from the music video placed on the screen behind the band, enabling them to take part in the performance. The same assets were then used on The Voice Live, beaming in BTS as holograms during the song whilst Coldplay performed.

This repurposing can be taken further by dropping these assets into live broadcasts, perhaps to enhance a performance – such as multiple 3D versions of Madonna appearing simultaneously with her physical self on the

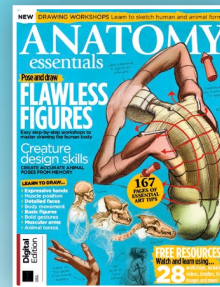
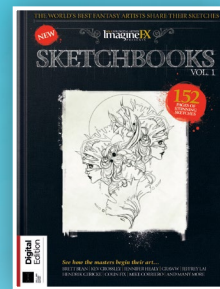
## “THERE ARE SO MANY WAYS TO GIVE PEOPLE EXPERIENCES THAT ARE **ABOVE AND BEYOND WHAT WE’VE ALREADY SEEN**”

2019 Billboard Music Awards show, the first live broadcast to feature volumetric capture. Or perhaps another use case could allow talent ‘appearing’ on stage at an awards show if they are unable to be there in person. Assets can also be used to create fan experiences, enabling them the opportunity to interact with their favourite band or actor in a virtual environment.

It’s an exciting time for volumetric capture, because it is still so new. As

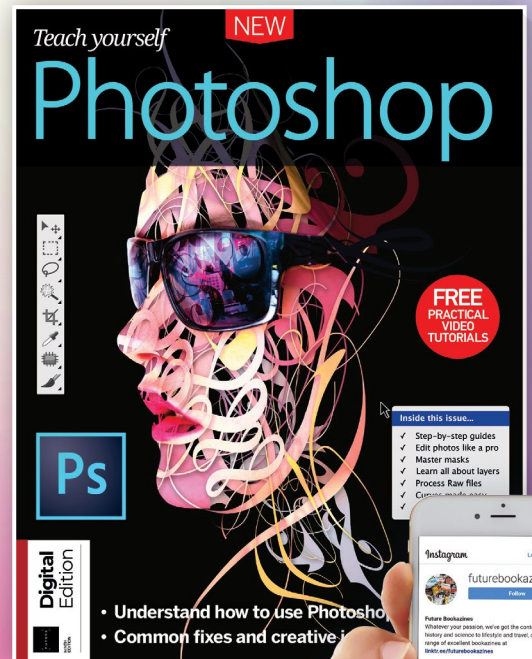
conversations about the metaverse and AR and VR become part of standard discussion around entertainment production, the technology is only going to improve and opportunities will continue to grow exponentially. There are so many ways to add value and to give people experiences that are above and beyond what we have already seen today. What the future might hold for this technology is really only limited by imagination.





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FUTURE







## PROJECT INSIGHT

# How to capture a career in volumetric video

Arcturus takes a break from creating tools for next-generation volumetric video content to share some career advice with 3D World readers

**V**olumetric video is the future. Its ability to capture events in three dimensions makes it the natural evolution of our current video, and it can be used to create interactive viewing experiences, holograms, AR content, and much more. Industries like fashion, sports, training and music have already begun to see the impact of content created using volumetric capture techniques, and within the next few years, the potential for this type of content is going to flood into multiple fields. With all this in mind, there's never been a better time to look into a career in volumetric video.

To find out how you can break into this burgeoning medium, **3D World** turned to the experts to get their perspective on the industry, and the various roles available to digital artists. As creators of the industry-leading HoloSuite toolset, which is designed to edit, compress and stream volumetrically captured content, Arcturus is perfectly placed to help readers find out more about the industry surrounding volumetric video, and how to capture a dream job.

### What are some of the common roles people can have in volumetric video?

There are several roles you come across often in the creation of volumetric video; the first is a 3D or volumetric video specialist. This person becomes an expert user of one specific product (or group of products) and assists clients in the successful completion of projects. It's a chance to work with cutting-edge technology, finding ways to elevate existing programs and helping to create new experiences.

Technical artists are also becoming more and more prevalent in all industries. Although their job descriptions can be broad, they are typically tasked with developing new workflow solutions to improve the creative process and streamline projects, from research and development to implementation. Software engineers, on the other hand, tend to focus on the technical side of things, and work to develop new volumetric video products.

Another hugely important role is that of volumetric capture stage technician. These individuals support the operation

of what we call the 'volcap studio', the stage on which a performance is being volumetrically captured or recorded. They'll also maintain the hardware, upkeep the facility, prep the stage for shoots, run test captures, troubleshoot the hardware, and manage the software.

## GETTING STARTED

Does Arcturus have any useful resources for people looking to get into volumetric video?

You can get a basic understanding of how volumetric video works with our beginner's guide on our website. Our head of partnerships and marketing at Arcturus, Piotr Uzarowicz, delivered a video presentation at 2020's VR Days conference explaining how digital humans are created, modified and delivered using volumetric video and Arcturus' software, HoloSuite ([bit.ly/3zBcp68](https://bit.ly/3zBcp68)).

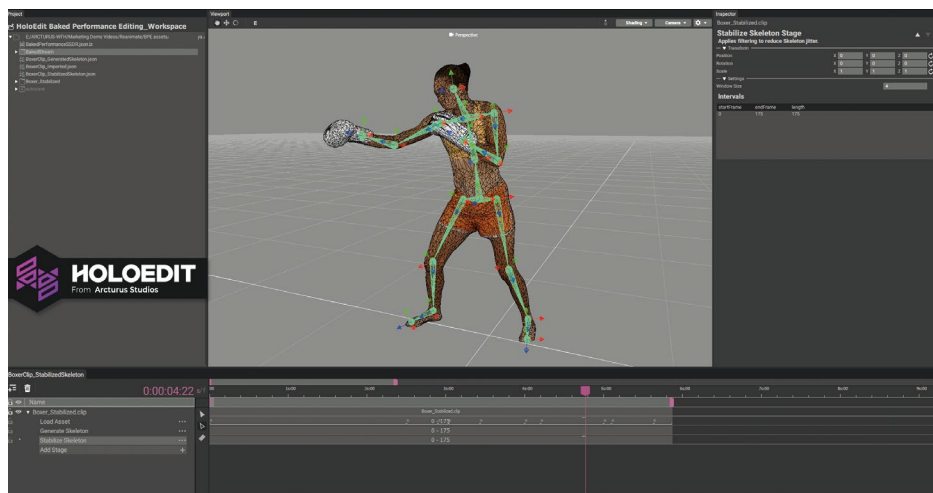


### What kind of background do Arcturus candidates have?

A lot of people come to us with post-secondary education in a relevant visual art or technical field, like 3D arts, animation or programming. This kind of education isn't an absolute requirement though. Industry experience carries a lot of weight as well.

Proficiency using coding languages like Python, C#, C++ or visual scripting systems like Blueprint in Unreal Engine are all common skills amongst our new hires. So is a solid understanding of optimising scenes, resolving bugs, and improving elements of the UI in game engines like Unity and Unreal Engine. Having experience in building rigs is also a big plus, and we definitely want to talk to people that are capable of maintaining a high level of visual and technical quality in skeletal data.

Overall, 3D experience is incredibly important in volumetric video. Successful applicants at Arcturus often have experience with 3D asset pipelines and digital content tools like Maya, Houdini, Blender, Mari, Unity, Photoshop, Premiere and Unreal Engine. They also possess an expert understanding of 3D assets, materials, texture baking and lighting, as well as an ability to work with 3D assets and photogrammetry data for high-quality visual results.



### What are some of the main skills that Arcturus looks for when hiring?

First and foremost are excellent computer and software troubleshooting skills – these are fairly essential when working at Arcturus. We also look for a solid understanding of 3D art fundamentals, as well as immersive media and the use of VR, AR, and VFX in production pipelines. Other useful skills that we look for include editing, composing, rotoscoping, matchmoving, matte and touch-up painting.

Outside of the technical stuff, great communication skills are essential for project management, tracking, scheduling

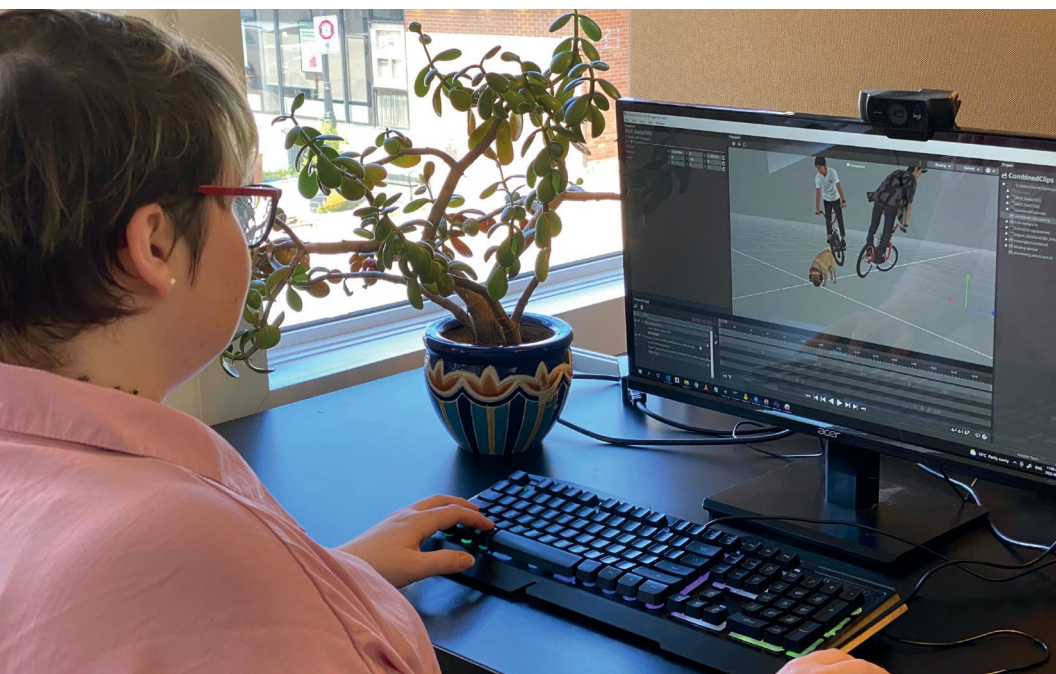
and bug reporting at Arcturus. We're also more likely to hire someone that has a decent understanding of IT principles like command line, render farms, cloud computing, computer networks, storage and data transfer, and basic scripting.

Since volumetric video is a new and evolving medium, we place an emphasis on finding people that are keen on learning and experimentation. While technical skills are useful, we don't disqualify candidates that have certain knowledge gaps as long as they are willing to learn.

### What type of education do you tend to look for?

We definitely look for a practical understanding of computer vision and geometric algorithms, as well as the aforementioned understanding of 3D art fundamentals. Experience with painting in Maya and Mari is something else we like to see in our applicant's education.

**“WE DON'T DISQUALIFY CANDIDATES THAT HAVE CERTAIN KNOWLEDGE GAPS AS LONG AS THEY ARE WILLING TO LEARN”**



### Where would you suggest a student begin pursuing volumetric video?

For students looking to pursue volumetric video, we always recommend they begin with production skills, including post-production. It's important that they understand 3D space and spatial computing – and the relevant applications – which is helpful when crafting great experiences and projects for the end user. Understanding how game engines work and what they power is also a big part of the future of media. From the metaverse to film and TV production, game engines are becoming increasingly important.

### Any other advice for launching a career in volumetric video?

The more projects you can work on and experience, the better. If you're in a position where you can take an internship, it might be worth it to build up your network, which is essential in this industry.





*The Outer Worlds 2* reveal trailer debuted at the 2021 Xbox & Bethesda Games Showcase

A DAY IN THE LIFE OF A...



NAME  
Kristian Zarins

JOB TITLE  
VFX supervisor

STUDIO  
Goodbye Kansas Studios

LOCATION  
Stockholm, Sweden

ABOUT  
Kristian works as VFX supervisor at Goodbye Kansas Studios, predominantly with full-CG productions such as game cinematics.

WEB  
[goodbyekansasstudios.com](http://goodbyekansasstudios.com)

# VFX Supervisor

We caught up with Kristian Zarins, who talked us through his typical day working for VFX powerhouse Goodbye Kansas Studios at their office in Stockholm

**I**'ve been in the industry for over 20 years, starting as a generalist and motion designer at smaller studios before gradually getting more and more into lighting. I joined Goodbye Kansas as a lighting artist, and worked as lighting lead on many cinematic productions. Last year I got promoted to VFX supervisor, and one of my first projects was the multi-awarded cinematic trailer for *The Outer Worlds 2*.

**08:30am** Every day starts with checking the latest renders, plus my mailboxes and our Rocket Chat channels for new messages. It's always good to do this before 9am when the rest of the crew shows up, to have a plan for the day ahead.

**09:30am** Production Sync Meeting with the director, art director, CG supervisor and animation supervisor. Discussing the latest feedback from the client and what tasks we should focus on, and our weekly send to client.

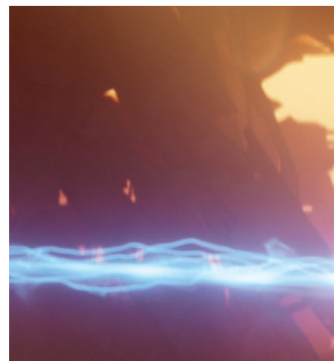
**10:00am** Light rounds. The lighting lead runs the meeting together with the coordinator. How are all tasks progressing, is everyone happy with the part or are there any issues we need to address? If I don't have any other meetings or urgent matters to take care of, I try to attend the different rounds during the day.

**10:30am** Compositing rounds. Same kind of meeting as the light rounds, but focusing on compositing. In the beginning of a

project this would probably be an animation round, but now we're well into the production of this game cinematic so it's time to focus on compositing.

**11:00am** FX rounds. And then it's time to discuss all the FX and how it's progressing. I'm probably on my third cup of coffee by now.

**"TO ME, LIGHTING IS THE MOST REWARDING PART OF ANY CG PRODUCTION"**





## LIGHTING THE WAY

Kristian Zarins talks the joy of following a big VFX project from start to finish

### How did your career in VFX get started?

I started as a generalist, and I was very much into motion graphics and smaller production for television, before getting more and more into lighting. To me, lighting is the most rewarding part of any CG production, since it's the step where all separate assets get together for the very first time to reveal the first glimpses of how the final imagery will look. When I started at Goodbye Kansas Studios, I could finally devote all my work to lighting and I worked on many great game cinematics. To become a VFX supervisor was in a way a logical next step for me. I really like to see the entire project come together, from A to Z. It's an amazing experience.

### What advice would you give to those looking to get started with VFX?

Passion for the craft is crucial to succeed, so start exploring the world from home, learning the software that is at hand, and maybe try to imitate a piece from your favourite VFX scene from a movie or series. Explore the world of CG, but always look for good real-life references. Even though it might be a stylised or alien world you're working on, it's still good to look at the real world, people or nature to get something that people can relate to and to make the piece more believable.

A good education is also important. Schools are also a great way to get in contact with your future employer. Watch the credits of films, TV and games, look up your favourite VFX studios and study how they produce their work. One day you could be doing your internship there and later on be an employee.

### What qualities, skills and abilities are essential to a VFX supervisor?

A keen eye for quality, but also the ability to listen to your team. You can never be master of all parts of a production, so it's essential to make the best out of all the expertise your colleagues sit on in their fields of work. It's also important to always have the full scope of the project in mind, rather than getting too granular on separate shots or assets.

### What do you enjoy most about your role?

I really enjoy that mix of tech and creativity and the opportunity to work with so many great people. And it's wonderful to follow a project from start to finish, to be part of that journey where the whole piece comes together. It's a very rewarding feeling to deliver a game cinematic that you've seen grow from idea to final result, to watch that final result and feel you really nailed it!



**11:30am** Leads meeting. 2-3 times a week we gather the lead artists of each department so that we can discuss various tasks cross-departments. How can we make that face look better? Is that something that should be addressed by the Lighting team, or should the Look Dev team take a look at it. Or will tweaks in animation help?

**12:00pm** Lunch. If I'm at the office we go out to one of the great restaurants in the area. If I'm working from home I usually just grab a quick bite before taking a walk.

**13:00pm** Twice a week we have CFX reviews. The cinematic we're working on right now involves lots of cloth and hair, so there's always something new to discuss.

**14:00pm** Two o'clock is 'cut-off time', when all artists need to publish

the latest version of their shot and tasks. I use this hour before the Dailies to look through everything and make notes and feedback in ftrack. It's essential to come well prepared for the Dailies.

**15:00pm** Dailies. Usually an hour, sometimes longer. Depends on what stage of the production we're in.

**16:00pm** DAS review. Twice a week I have a review with the director and art director to go through shots that I feel are in a good place and ready to get internal approval or their input on.

**17:00pm** Once a week we send a WIP of our work to the client. I like to add detailed notes along with it so it's clear to the client what's still in progress and what parts we want them to approve.

**18:00pm** The work day is over and now it's time to eat and play with the kids. Goodbye Kansas is utilising a hybrid work model post-COVID, so we can choose if we want to work at home or the office. At the moment I mostly work from home, but we make sure that at least the core team meet up IRL every now and then as well.





INDUSTRY INTERVIEW

# Bringing photogrammetry to stadium audiences with Ed Sheeran

Vincent Steenhoek, founder and managing director of EVOKE Studios, explores how the company produced ten unique pieces of video content for the artist's in-the-round Mathematics Tour

Ed

**Sheeran's long-time creative director, Mark Cuniffe, commissioned us to create unique video content for a total of ten songs on**

**the Mathematics Tour, and from the beginning we were determined to deliver consistent high quality across all of them, despite the different look of each track.**

It's a very complex task to design content that works in-the-round, unless you choose to segment it and turn it into 2D screens again, which itself is counter-intuitive. This project was both exciting and daunting at the same time, but as a studio, we truly thrive off complexity and testing ourselves creatively.

Initially, we used Notch and VR to show both Ed and Mark our vision in real time, in addition to stencilled mood boards of the 3D designs. Our team developed ideas to craft content, materials and 3D models for several applications, then imported these stencils into Notch to light and animate the scenes.

Notch was integral to this process, as it allowed us to use the same assets across all the production teams. For example, in the song *Shape of You*, the rendered shapes were used for the video effects to influence the IMAG (the image magnification screens usually found at the side of the stage in

concert tours), as well as the images behind the IMAG and where it appeared on stage.

As a company, we're well known for leveraging the latest in performance design technologies, and this project was no exception. For a number of songs, we used motion capture and photogrammetry technology to construct a virtual model of Ed, which we could use during the content creation process. This was done, in part,

**"WE USED MOTION CAPTURE AND PHOTOGAMMETRY TECHNOLOGY TO CONSTRUCT A VIRTUAL MODEL OF ED"**

Vincent Steenhoek, founder and managing director, EVOKE Studios

to ensure that the fans could connect just as strongly with the song-specific video content as they did with the artist himself.

Photogrammetry enabled us to create what is arguably the biggest look of the tour, for the song *Bloodstream*. The inspiration for that song's video content came from the lyrics, which reference different chemicals

flowing through veins and how they can affect you. We wanted to make those mental processes visible, and by being able to animate Ed's face to a high level of detail (despite the fact that the model is heavily treated), we could really represent a whole range of emotions in a particularly striking way.



Photo Credit: Ralph Larmann





As well as being able to create impressive-looking video content for Ed's live shows, going through the motion-capture/photogrammetry process comes with long-term benefits too. For example, because we now have that data on hand, we have the ability to take him into the metaverse or create even more unique video looks further down the line, in broadcast as well as live applications.

There were challenges, of course, as there always is with jobs as complex as this. One of the main obstacles our visual content teams faced during the pre-production process was caused by the sheer size of the touring stage itself.

There isn't a rehearsal studio in existence that would have allowed us to build the full stadium stage and gauge

how the screens would look from the furthest seats in the venue. This creates a lot of problems, including what frame rates to use and how to scale the text and content itself. We want the video to look impressive whether you are standing 10m or 100m away, and this was something that could only be fine-tuned once we were on the road.

Of course, we couldn't do any of this without the trust of people like Mark and his company, Twotrucks Productions. We've earned this trust over the years – and it goes both ways – but that doesn't make us any less grateful for the incredible opportunity.

Our relationship is a symbiotic one. There's a lot of respect for what each party does and is capable of doing. Our

main aim is to create something that Mark can connect with, but that we like too, and he understands that. It's so gratifying to have this kind of working relationship with give and take; Mark trusts us to maintain the high standards that he has come to expect from us.

More often than not, this means pushing ourselves and using the best technology available to create visual content that people have never seen before in this kind of live event or setting. That's what gives us the energy necessary to take on these huge projects, and it's what gives us a real sense of pride and determination for the future when we look back on monumental jobs such as this.

**FYI** You can find out more at <https://evokestudios.io>



## PROJECT INSIGHT

# A decade of innovation

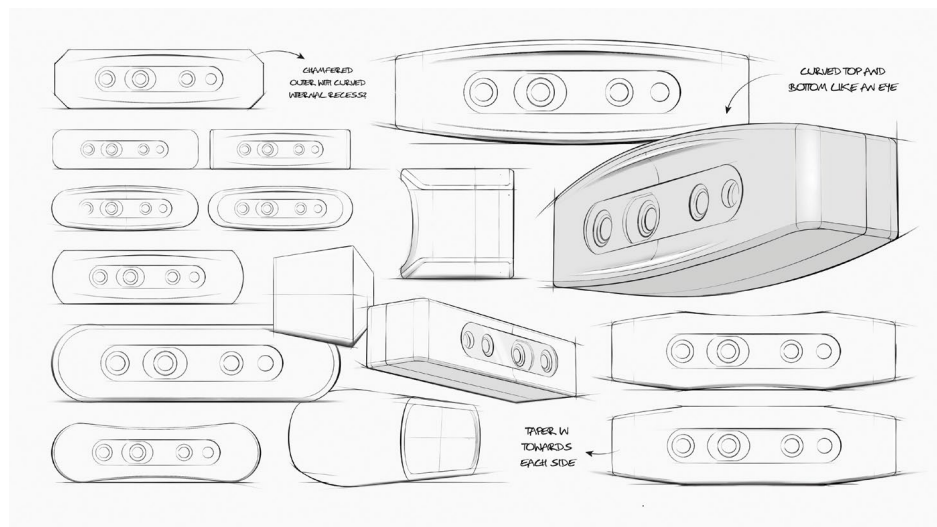
3D World celebrates ten years of Ncam's forward-thinking, real-time VFX solutions with CEO Nic Hatch

**If** you're even vaguely interested in VFX, chances are you've heard of real-time technology and how it's revolutionising the way that visual content like film, television and live events are created. Originally established in 2012 out of a need to create a complete virtual production setup for live previs shots, few companies have proved as pioneering in real-time VFX as Ncam.

With patented technology and multiple awards to its name, the company's 10th anniversary seems like the perfect time to look back and celebrate a decade of innovation, while casting a hopeful eye to the future of this ever-changing industry. To do just that, **3D World** caught up with Nic Hatch, CEO of Ncam, to discuss the journey so far, the evolution of real-time technology and their proudest achievements. Let's get started by winding the clock back to 2012.

### CHANGING THE GAME

Roland Emmerich's *White House Down* provided Ncam with its first opportunity



to prove that its solution was the future of filmmaking. The team used MotionBuilder to supply simple previs assets that they rendered and composited with Ncam's native tools. Back in 2012, there was simply no other way to create a virtual production solution. Ncam's tech continued to be utilised during principal photography,

primarily for compositing actors onto virtual environments, allowing the filmmakers to compose shots through the lens as if the environments were real. "There was an amazing moment where Roland asked, 'Where's my Ncam?'" says Hatch. "He had become so accustomed to using Ncam to frame up his shots >

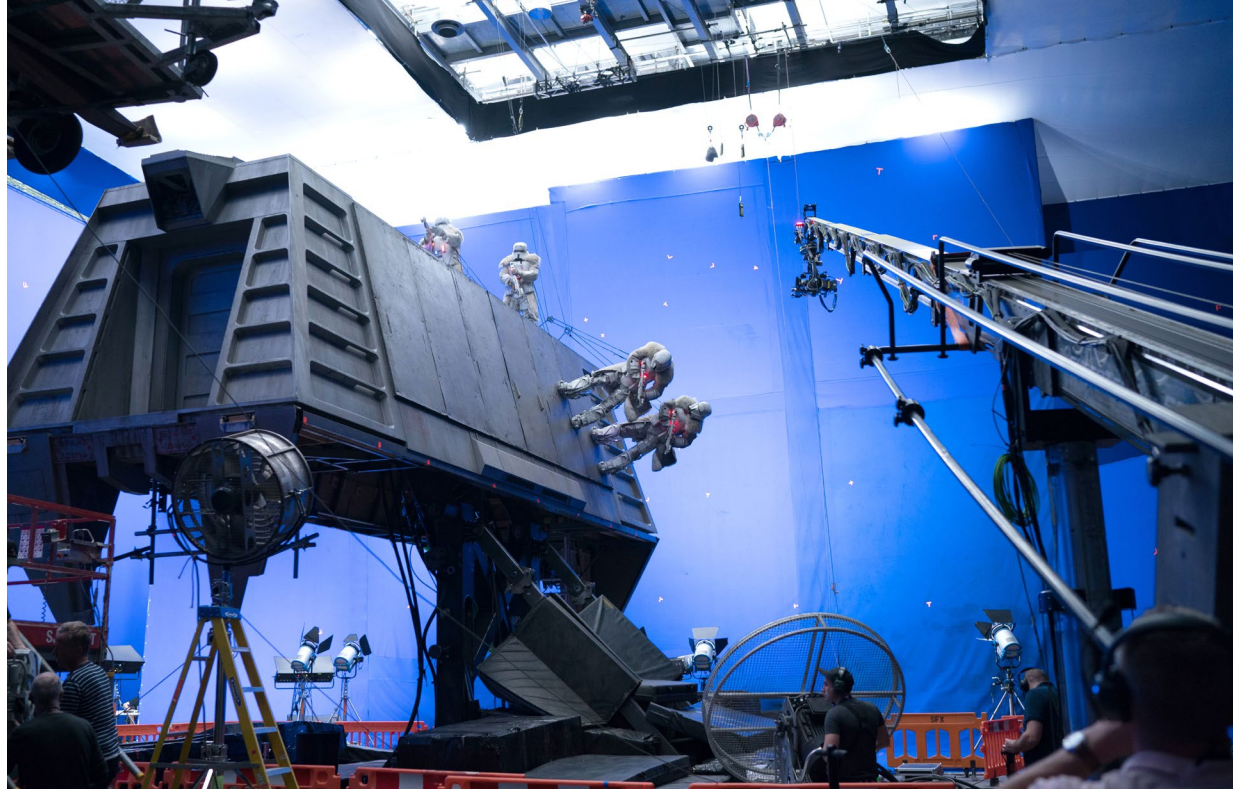




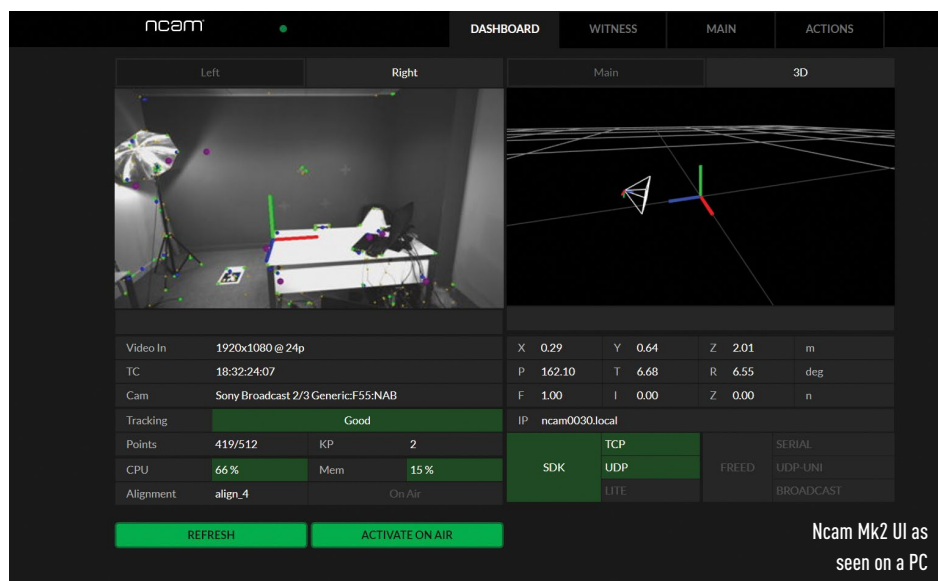
**Top:** *Solo: A Star Wars Story* utilised Ncam real-time previz on set

**Middle:** Ncam's Mk2 camera bar, with early prototypes seen on the left

**Bottom:** Comparing the Mk1 and Mk2 shows a huge difference in size







➤ and make the correct lens choice that the moment it wasn't available, it was an issue."

The director labelled Ncam his new favourite tool and the team realised they had something special on their hands. Going forward with the knowledge that their hard work and dedication had been worthwhile, Ncam found its first broadcast customer, FOX Sports. The LA-based broadcaster had been alerted to Ncam's work and was keen to see what all the fuss was about. "In those days, when someone saw Ncam for the first time, they were blown away," Hatch says. "There was simply nothing like it on the market where you could track a camera on a jib, dolly,

Steadicam or handheld." FOX Sports had big ambitions and Ncam helped them deliver a world-first: live camera tracking during the Super Bowl, placing AR graphics on the field from a Steadicam.

These milestones helped ensure that the benefits of Ncam's solution spoke for themselves. However, it was clear to Hatch that, in order for the technology to be scalable, it needed to be a robust, easy-to-use and affordable solution that could track any camera in difficult and/or constantly changing environments. The company took a unique approach, based loosely off SLAM methodology or 'robot vision', then tweaked, customised and honed it to deliver

on their original vision. When the prototype was unveiled for the first time at IBC 2013, the positive feedback was instantaneous.

No one had ever seen a system capable of accurately tracking a live camera in real time, without the need to add tracking markers or have multiple cameras rigged. Ncam's solution was truly groundbreaking. And, since 2012, the team has continued to improve the technology, boosting functionality and ease of use.

## FLIPPING THE SCRIPT

"Ten years ago, the ability to look through a lens, mix the physical world with CG and be unable to distinguish between the two was







Actors and crew mingle on the set of *Fantastic Beasts*, which used Ncam

just a dream,” Hatch reflects. The ability to track the camera in real time with no discernible lag is now the foundation of AR, XR and in-camera VFX; without this and the rendering power of a powerful game engine, it wouldn’t be possible.

Today, Ncam continues to turn the traditional approach to VFX on its head, taking it from a post-production operation to a fully fledged production process. By eliminating the need to ‘fix it in post’, the solution can save time and money while additionally opening up new avenues of creativity for users.

Of course, camera tracking is far from the only technology that has developed over the last decade. Game engines have also played a massive part in this space, and the tools artists have at their disposal in terms of real-time content generation is constantly growing. Ncam tech enables teams to replace physical sets with virtual ones, in real time, including assets like believable creatures. Technology like this, and the ever-improving quality of digital humans, grants storytellers the freedom and flexibility to push the limits – and ultimately eclipse them.

## THE BIG PICTURE

Company culture is as crucial to the success of Ncam’s first decade as its technological innovation. “The culture is something we have actively worked on for as long as I can remember, and is a defining characteristic of the company,” says Hatch. “It’s not something you can create in a hurry, and it’s not something you can buy, but without it your longevity will always be at risk.” Ncam now has staff all over the world, including the UK, US, Europe, China, Brazil, Argentina and New Zealand.

Still, Hatch looks back fondly on Ncam’s days as a tiny team blazing a trail through

## THE PRE-VISION

CEO Nic Hatch tells 3D World about the experiences that led him to start Ncam, and how the solution evolved

To understand Ncam’s origins, we need to rewind back to 1999 and production of the first *Harry Potter* film, when Nic Hatch was working at Mill Film as previs supervisor under Rob Legato. An acclaimed VFX supervisor that had just earned an Oscar for his work on *Titanic*, Legato was keen to visualise some of the film’s more magical shots through the camera lens. The shot in question saw boats gliding towards Hogwarts as the camera tilts to reveal the enchanting castle for the first time. It was based on a system called Free-d, developed by the BBC and MPC, whereby a witness camera on the main cine camera looked up at unique circular markers (fiducials) mounted in the ceiling trusses and worked out the position and orientation. The Hogwarts previs model was mixed and overlaid with the live action of the boats.

This was Hatch’s first encounter with Simulcam, and he couldn’t let go of the notion that it could be easier. “For *Sweeney Todd*, I was managing a project to deliver on a similar solution,” he says. “Based on a witness camera attached to the main cine camera and using unique tracking markers placed on the stage walls, it tried to work out the position and orientation of itself. It was okay, but wasn’t robust enough to work in a production environment.”

Hatch then explored various other means of tracking cameras, including



laser and sonar-based systems, but nothing would deliver the required flexibility and heft for production.

Then, in 2010, he got a call from Legato. He was headed to the UK to shoot a film, and wanted to be able to view the VFX backgrounds through the lens, in real time, whilst shooting the foreground plates with actors and some physical sets. The film in question was Martin Scorsese’s *Hugo*, and the task proved immense but hugely successful.

To realise Scorsese’s fantastical vision, the pair devised a less-refined version of Ncam’s current solution, which earned the film a VES Award for Virtual Cinematography and the Oscar for Visual Effects. “The technology was super basic and yet it still got us there,” says Hatch. “Who knew how far it would come?”

the industry, something of a rarity in the technology space. “The early days of flying around the globe to demonstrate a technology no one’s ever seen before and creating a market that didn’t exist was amazing, but it was also exhausting and unsustainable,” he laughs. And, he wishes he had always been safe in the knowledge that his vision was undeniably spot on, adding: “The doubts and the doubters aren’t all that helpful.”

Looking forward to the next ten years, Hatch points out that although real time will always be fundamental to Ncam’s approach, there are plenty of other things they can build upon. In particular, Ncam’s datasets have the potential to improve the post-production process, and Hatch teased an upcoming product that will allow users

to repurpose Ncam datasets for non real-time use. “This is going to be extremely powerful, and it’s something that has been unavailable until now,” he says, “so watch this space.”

And what about the next ten years? Ultimately, Hatch’s biggest hope for the next decade is to continue working with customers and partners that inspire him every day. Success isn’t purely a numbers game for Ncam; rather, the team is focused on delivering solutions for hard-to-solve problems and answering the real needs of those working in the industry. “I’m not interested in creating technology for the sake of it,” he says. “Ultimately, storytelling is key. If we can aid in the process of telling incredible, compelling stories, that’s extremely fulfilling.”



# Reviews

We explore the latest software and hardware tools to see if they are worth your time or money



## AUTHOR PROFILE

### Paul Hatton

After graduating with a first-class computer science degree, Paul Hatton has spent nearly two decades working within the 3D visualisation industry.

## + PROS

Impressive results are easy to achieve

A huge array of off-the-shelf models and materials

Better performance than ever before

## - CONS

Powerful graphics card is required

Not officially supported for Macs

## OPENSTREETMAPS

With this brilliant tool, you can place your models inside real-world places. This is achieved by importing a range of different assets, including ground data and buildings.



## SOFTWARE REVIEW

# Lumion 12

PRICE £1,540 / \$1,895 (Pro version £3,090 / \$3,790) | COMPANY Lumion | WEBSITE lumion.com



**D**espite not releasing until 2010, Lumion's journey actually began back in 1998. Its early foray into the industry went by the name of Quest 3D, a 3D engine that could be used as a simulation and visualisation tool. In 2007, nearly a decade after it all began, its creators decided to turn their attention towards architects and visualisers; primarily creating a tool that could create real-time images and videos without the need for much technical knowledge of the 3D graphics world. A few years later, Lumion became a reality and since its inception

it has amassed quite the following, becoming a popular tool in many architecture firms and visualisation studios. Now at version 12, let's see what's new in its locker and whether it might be worth giving it a try.

First up, Lumion is well known for its library of models and materials. It is certainly welcome to see the addition of over 100 animated plants, nearly 600 library items and over 50 new materials. These additional off-the-shelf assets make it even easier for artists and architects to dress and populate their scenes with impressive-looking content. The fact that these libraries

are getting bigger with every release also helps to mitigate against all Lumion visualisation looking the same. On top of these additions, Lumion has made it possible to use number plates from ten different countries as well as all US states. To be able to utilise local assets will help to contextualise projects in a meaningful way. In addition, it's now also possible to upload your own images for custom plates. All of these library and asset changes make the creation process in Lumion even better.

For those looking for lighting improvements,

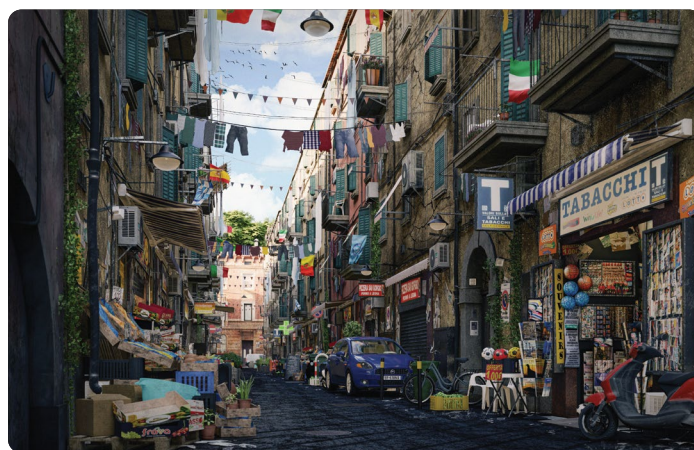




**Left:** This moody scene by Pasquale Scionti shows off Lumion's impressive lighting capabilities

**Above:** Carlos Carpetudo's reconstruction of a Roman villa demonstrates some lovely lighting

**Below:** Lorenzo Dragotto's jam-packed scene displays Lumion's ability to handle dense and complex geometry



Lumion has added volumetric effects to both its omni and spotlights. These types of effects add another layer of realism and depth to scenes that may otherwise appear flat and uninteresting. This effect on omni lights can be used to show dust or mist, and for spotlights can create a beam of light coming from a light source. These additions further strengthen an already impressive set of easy-to-use lighting tools. The temptation will, no doubt, be to overuse this effect, but when used appropriately and creatively it will really help.

To give artists further control over the look and feel of their scenes, Lumion has also introduced a new 'ambient light color' tool. This lets artists quickly set the mood of their scene using the simple Kelvin scale, ranging from warm to cold. It's surprising that this

has been missing for so long as it's been a key part of most rendering engines for a long time now.

The final additions to Lumion 12 centre around its workflow and performance. At its core, it has always benefited from a simple workflow, but this latest version enhances and builds on that. Interfaces have been cleaned up, character billboards added and layer management enhanced. The Lumion team has also boosted its LiveSync feature to now include Autodesk FormIt Pro. This feature provides users with a real-time connection between Lumion and various 3D modelling and CAD programs.

By further extending the range of programs that LiveSync supports, Lumion is cementing itself into the heart of people's workflows. This will continue to increase its user

## "THESE ADDITIONS STRENGTHEN AN ALREADY **IMPRESSIVE** SET OF **EASY-TO-USE** LIGHTING TOOLS"

base and popularity, especially amongst architects.

It's great to see that within version 12, Lumion has continued to release free updates. To receive these semi-frequently creates a real sense of togetherness with the developer and guarantees

that progress is being made. It's worth noting that there are two versions of Lumion, a Standard and a Pro version. Most of the features discussed in this review are only available with Pro, so that's worth considering if you're thinking about giving it a go.

### THE VERDICT

**8.0**  
OUT OF 10

#### LUMION 12

Lumion continues to be a powerful tool that has tapped into a very nice niche in the market. If you're looking for a program that can help you visualise your designs, then Lumion is well worth a look.





#### AUTHOR PROFILE

**Paul Hatton**

After graduating with a first-class computer science degree, Paul Hatton has spent nearly two decades working within the 3D visualisation industry.

#### + PROS

Incredible customisation of interface and tools

Shading with the Shader Tree just got better

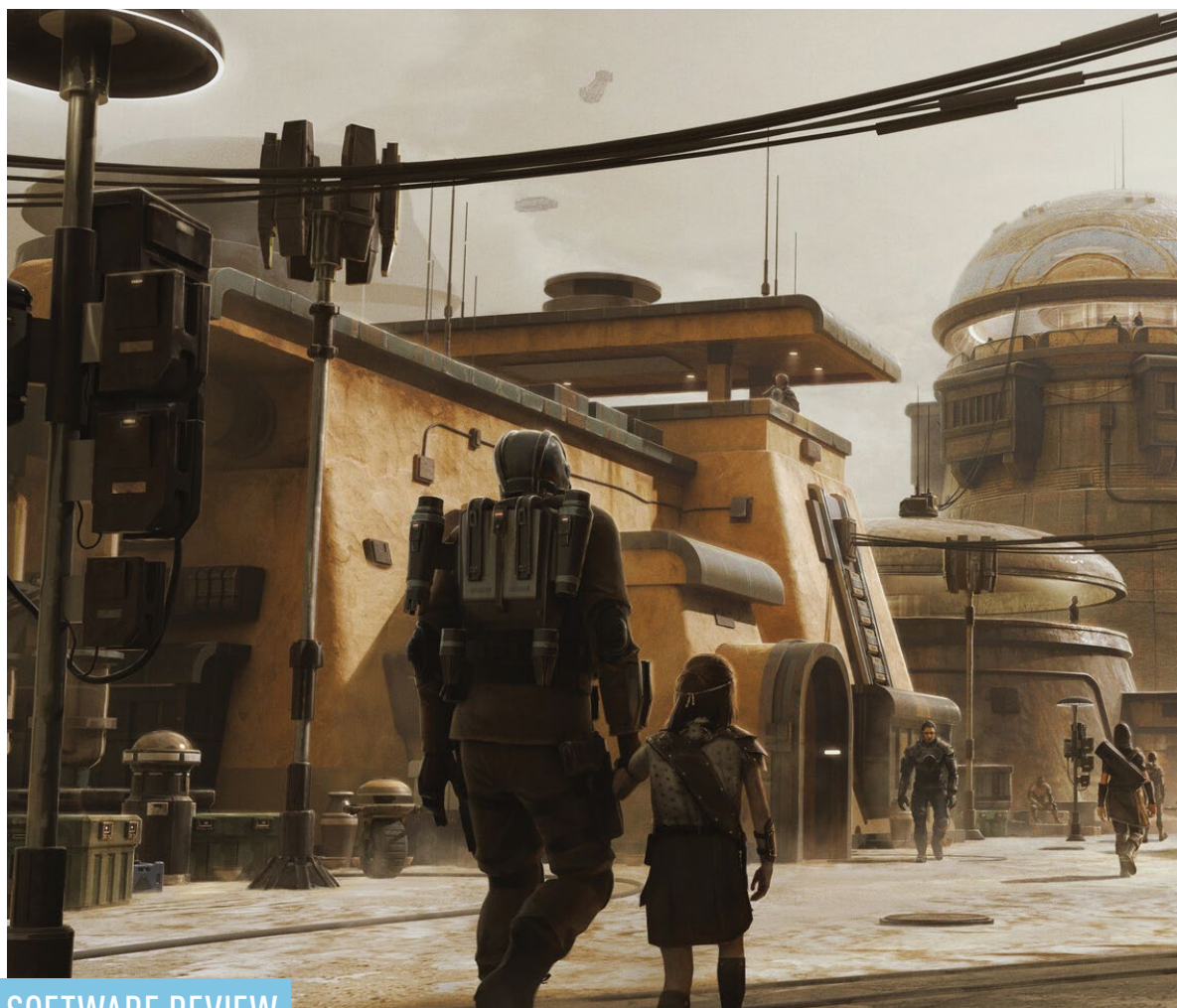
Great organic and hard-surface modelling

#### - CONS

Steep learning curve

#### INTEL DENOISER UPDATE

For Modo users frustrated with longer than necessary render times, you'll be glad to hear of the time-saving benefits of Intel's denoiser updates. Prior to these updates images would render relatively quickly, but a lot of time would be spent at the end cleaning up the noise. Those days are thankfully behind us.



## SOFTWARE REVIEW

# Modo 16

Above: Kevin Jick's 'Streets of Ta'ak', inspired by *Star Wars* and made using Modo

**PRICE** £569/\$629 yearly or £57/\$62 monthly | **COMPANY** Foundry | **WEBSITE** [www.foundry.com/products/modo](http://www.foundry.com/products/modo)

**M**odo is a serious powerhouse in the 3D industry, utilised by the likes of Pixar and Industrial Light & Magic, to name only a couple – with films such as *WALL-E* and *Iron Man* demonstrating that this software is certainly no Little League player. Starting out as version 201 in 2006 and sticking to a major new release almost every year, we're now at version 16. Join me in taking a look under the hood at this update's new features and improvements.

Let's start off by exploring some of the software's modelling enhancements. Modo 16 features mesh slicing improvements, with both the

Primitive Slice and the Slice Effector taking the process to the next level. This includes slicing using both curves and profiles, extending the set of already useful slicing tools.

You'll also find changes to the selection tools, primarily through the Conditional Loop tool. In essence, designers can now add conditions to their loop selections; most notably, these loops can be defined by a set angle or by whether loops are allowed to cross or not.

The last modelling update to note is the Wrap Effector, and it's really handy! Artists can now make use of a lattice cage mesh to deform a target mesh. The new deformer is efficient and effective, making

it simple and straightforward to effect big changes to your models without getting involved in the actual mesh itself. If you love non-destructive tools, then this will be right up your street.

Let's turn our attention to Modo's Shader Tree, its built-in tool for shading. This is a layer-based system that controls how shaders are constructed. It's a really powerful solution, and because it's layer based it's really easy to see how each layer is contributing to the overall output. The tree has received a few notable improvements that will make creating shaders even easier. Groups have been given a graphic which shows how that





“THE SHADER TREE HAS RECEIVED A FEW NOTABLE IMPROVEMENTS THAT WILL MAKE CREATING SHADERS EVEN EASIER”

group is masking its contents, and the contents of a group can be reorganised by effects. There is also now visualisation of blend modes and opacity, which help with understanding how materials are put together.

In my opinion, one of the best things about this update is the Conditional Command feature. The reason that it features so high up in my estimations is because it brings the software and the user closer together, making the software almost more intelligent as it melds itself to the user. I'd love to see more artificial intelligence built into software, and this feels like a nod towards it. So what does this feature actually do? It

enables users to specify what happens as a result of another action. In the promo material, Modo uses this example: “An artist notices that every time they go into vertex mode, they only ever use the Vertex Bevel tool. They could then use conditional commands to tell Modo, ‘Every time I click on vertex mode, activate the Vertex Bevel tool for me.’” This is classic Modo, ensuring that the power is in the hands of the users.

Last up in our foray into version 16 is the Non-Photorealistic Rendering 2 kit, which is now included for free. Modo attracts a wide range of users including technical illustrators and animators; both



Above: 'The Mars Ranger' (top), 'O-TECH - Thirteen' (middle) and 'COSMO - 9031' (bottom), images created by Epic Games' lead technical artist Mathew O

of whom may care less about photorealism and more about creating something that is organic and natural. Through this kit artists can make use of lines and block colours, perfect for the likes of product viz and anime. Please note that this kit does require downloading from their website.

When it comes to new version releases, there can

be little worse than when a software update leaves you completely underwhelmed, wondering what on earth the developers have been up to in the time since the last release. Thankfully, Modo 16 is far from that; it's an extensive and impressive update, with lots of user-focused new features guaranteed to keep you creating incredible content.

## THE VERDICT

**9.0**  
OUT OF 10

### MODO 16

This is a major release with a ton of new features and updates to make it even more powerful than it was before. We've only scratched the surface of what has found its way into this new release, and that's really exciting.





#### AUTHOR PROFILE

##### Paul Hatton

After graduating with a first-class computer science degree, Paul Hatton has spent nearly two decades working within the 3D visualisation industry.

#### + PROS

More presets added

Impressive shading capabilities for fire and smoke

Simulations can now be processed standalone

#### - CONS

More powerful and extensive simulators do exist

#### STANDALONE SIMULATOR

This previewer is a tool that enables users to see their simulations without having to load them into either Maya or 3ds Max. This can save time, especially if you need to review multiple simulations or preview options without the hassle of getting it set up in one of the aforementioned packages. The previewer accepts VDB, AUR, PRT and F3D file formats. This previewing tool doesn't yet support the previewing of meshes, but no doubt that will only be a matter of time.



Above: The production capabilities of Phoenix are stunning. © Chaos

## SOFTWARE REVIEW

# Chaos Phoenix 5

**PRICE** £300 annually or £55 monthly | **COMPANY** Chaos | **WEBSITE** [www.chaos.com/phoenix](http://www.chaos.com/phoenix)

**E**ver heard of *Game of Thrones*? Thought so. This award-winning fantasy drama series utilised Phoenix for visual effects work, that's how good this dynamics simulator is. Joern Grosshans at Mackevision, VFX supervisor for the series, said, "We needed the wakes coming off the CG ships to look as realistic as possible. Phoenix proved to be reliable, fast, and seamlessly integrated into 3ds Max." Considering production of *Game of Thrones* stopped a few years ago, has Phoenix continued to evolve and improve?

Viewers would be forgiven for thinking there was no way for this software to better itself, but Chaos thought otherwise. Development and

improvement has very much continued with each release. Now up to version 5, Phoenix has even better features than were available to the likes of Mackevision. Let's see what's been added and whether it's worth the upgrade.

For a lot of users, the first thing that will please and impress is the new and enhanced presets. Presets are great for making the creative process quicker, easier and more enjoyable as well as giving a great starting point for customising solutions. The more common examples, fire and water, have been a mainstay for this simulator for a long while, but these have been improved in terms of quality, realism and speed. I know you'd expect that to be the case with every iteration

but, rather than stopping there, they've gone even further and provided some more out-of-the box presets to give artists a helping hand. These include 'Stormy sea', 'Jet engine', 'Ice cubes' and 'Speedboat'. To have these as starting points will help many users, but particularly those who are new to Phoenix. It is these types of presets that will really appeal to the less technical type of artist.

Aside from presets, there are new features and improvements to Active Bodies. This is the feature that enables two-way interaction between the objects in your scene and the simulation you're running within Phoenix; in essence it connects your simulations to non-simulated objects. Now for the changes





to this feature. First up is the addition of the 'Active Body Thruster'. Doesn't that sound incredible? This force enables animators to move Active Bodies with a directable engine force. In terms of application, think of a jet pack or a rocket booster, that sort of thing. The force has the obvious parameters of magnitude and initial velocity, but also includes the ability to be attached to the body so that when the body transforms (position and rotation) the direction of the force will be adjusted too.

Within Active Bodies you now also have something called 'Axis Lock' for restricting transformations along either a horizontal or vertical axis. And finally, Active Bodies can now be set to emit, attract or retain fluids for fine-tuning how they interact with the scene.

Artists looking for more improvements to the shaders will be pleased to see a new offering available. It's called the 'Voxel Shader' and is designed for shading fire and smoke simulations and meshes in a single simulator.



**Above:** Chaos Phoenix's ability to create beautiful boat wakes is perfectly demonstrated in these images by Gregory Glezakos



**Above:** Updates to Phoenix's Liquid Foam patterns include the ability to quickly and easily add extra variety to the pattern's size and look

In computer graphics, voxels represent values in 3D space, and so this shader enables artists to control the shading of the voxels within their simulations. In practice, this means Phoenix provides a set of parameters that are specifically suited to shading fire and smoke simulations.

Before we close up this review, it's also worth mentioning that Chaos has improved its Liquid Foam patterns so that it's quicker to render and more realistic in the output. With four parameters to your foam patterns, you can create some incredibly realistic and varied foam.

All in all, this is a solid improvement to an already powerful fluid dynamics simulator. The fact that the changes in version 5 are spread across various parts of the software is a big win, and even though there is no single stand-out feature in this release, general improvement

across the board shows how strong this simulator already was. Just as the developers state, Phoenix can create "fire, smoke, liquids, flames, explosions, rigid body simulations, ocean waves, mist and splashes to list just a few" – and it does this very well indeed.

## THE VERDICT

**9.0**  
OUT OF 10

### CHAOS PHOENIX 5

Phoenix is a fantastic piece of software with a rich and varied set of features. All new additions make this application even more impressive. The out-of-the-box presets give artists a great foundation for building more complex solutions.





#### AUTHOR PROFILE

**Rob Redman**  
3D World's editor Rob has a background in VFX, animation and filmmaking. When not at his desk, he can usually be found in the woods with his dog, Biscuit.  
[pariahstudios.co.uk](http://pariahstudios.co.uk)

#### + PROS

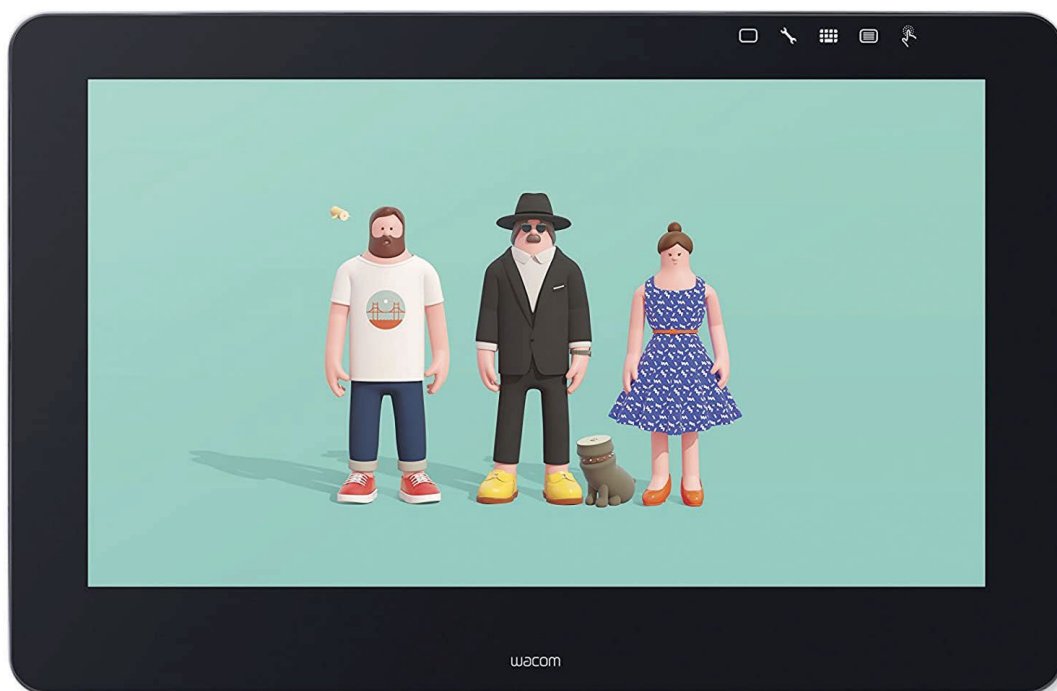
Excellent quality

Pro Pen 2 is wonderful to use

Laminated screen

#### - CONS

ExpressKeys take a little time to get used to



## HARDWARE REVIEW

# Wacom Cintiq Pro 16

PRICE £1,350/\$1,500 | COMPANY Wacom | WEBSITE [wacom.com](http://wacom.com)

**A**lthough there are a number of tablet manufacturers out there, Wacom is one of the longest standing and has a great reputation for quality. In recent years others have upped their game, keeping Wacom on its toes, so it's interesting to see if the latest incarnation of the Cintiq line can keep the company at the top.

At first glance, not much has changed. The typical Wacom build quality is obvious, in both look and feel. The Cintiq range has always looked classy while feeling robust; this version is no different, and in some ways better. Some older Wacoms had ExpressKeys on the top surface and while they worked fine, after a few months it would feel like dust could get into the gaps. This never impeded the functionality at all, but the move to the rear of the device helps things feel

fresh and new. This move also helps artists who like to lean on their device, as I do. There is a slight learning curve to having ExpressKeys on the rear, but it doesn't take long and soon feels very natural. There are buttons on either side of the device too, so equally suitable for left and right-handed users.

The Cintiq Pro 16 features multi touch, which has been improved on previous generations. Again, this is an incremental change but a noticeable one, where things feel responsive and, while I don't know what has been done behind the scenes, I would say there is a clear improvement in palm rejection over the last model.

As much as touch interaction is great to have, the pen is clearly the main way users will work with the Cintiq and this is one area that Wacom has always excelled in. The Pro 16 ships with

the Pro Pen 2, with 8,192 levels of pressure and 60 degrees of angle sensitivity. These figures might not sound miles ahead of the competition, however the Wacom pen feels excellent in the hand – well built, weighty and responsive.

The button action is lovely, they are well placed and the nibs are excellent. Speaking of which, the puck-shaped pen holder contains a number of spares, including some felt nibs which are wonderful to draw with, acting in conjunction very much like traditional pen and paper, so none of the sliding-on-glass feel.

This may be in part due to the laminated screen, which has a fine texture that also helps with glare reduction. I tested this in a number of environments with differing lighting conditions and glare was never a problem.





**Above:** The ExpressKeys on the rear help keep things clean without reducing functionality

**Right:** The Pro Pen 2 is one of the best pens out there, with excellent feel and build quality

## “THE GAP BETWEEN THE PRO PEN 2 NIB AND THE SCREEN’S SURFACE IS TINY, SO IT REALLY FEELS LIKE ENGAGING WITH THE ART”

This takes us neatly to the display itself, which is a 16:9 4K screen with 300 cd/m<sup>2</sup> brightness. While this may not be ground-breaking, compared to a modern phone, iPad or laptop screen it is plenty bright enough and reduces eye fatigue that can be caused by more intensely bright monitors. Clarity and contrast levels are excellent, as is colour accuracy at 98% Adobe RGB. Other options beat this, but in daily use you would never know.

The laminated screen aids the drawing experience better than many other options too. The gap between the Pro Pen 2 nib and the screen’s surface is tiny, so it really feels like engaging with the art, rather than hovering a little above it. This helps in the enjoyment and accuracy of drawing on the Cintiq.

Another improvement over older tablets is the quality of strokes. There’s no perceptible wave or wobble, other than that which is manually drawn, whereas older models could display some odd artefacts when zoomed in and stroke tails are natural looking and smooth, once you dial in the pressure settings to your way of working.

A tablet is usually only as good as its support and Wacom has done well here. There are VESA mounting points should you need them but the fold-out legs are excellent. Little flex and they raise the device by 20 degrees, which will feel about right when used on a standard-height desk and chair. Options are always welcome.

The same applies for connectivity. You can power up then connect via USB-C, but

if your host machine is a little older you can use a separate USB and HDMI cable. While many companies will offer just the latest option, it is nice to see Wacom thinking of the rest of us.

In a world where much is made of the environmental impacts that companies have, it is also good to see Wacom ships the product in fully recyclable packaging. No plastic wraps here at all, and Wacom should be commended for the move to be more sustainable.

So, all in all the Cintiq Pro 16 is a worthy successor. It doesn’t break the mould or change the game in big ways, but makes a number of small moves to keep the Cintiq at the top of the tree. Yes, you pay more for a Wacom but it is money well spent, as I have full confidence that the Cintiq will last for years, just like every other Wacom I have from the last couple of decades. If you work in a visual creative field, or eschew the mouse for a more natural interaction, the Wacom remains king of the hill.

### THE VERDICT

**9.0**  
OUT OF 10

#### WACOM CINTIQ PRO 16

Wacom remains the go-to option when the very best build quality and pen experience is needed. The premium asked for is worth it for this best-in-class device. Drawing is a joy, and it’s adaptable for any studio.



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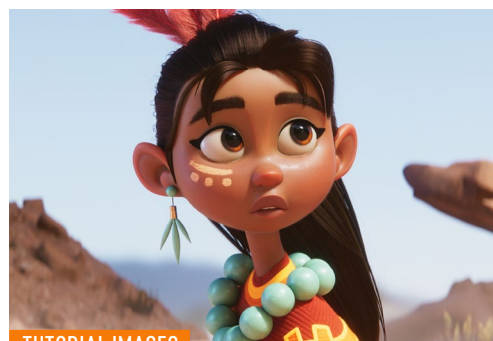
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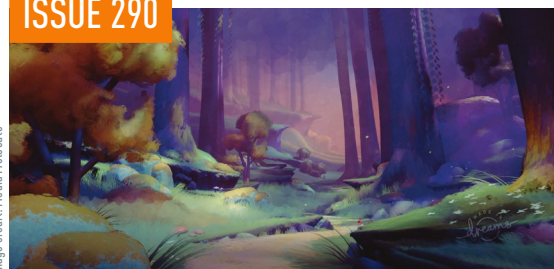


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ISSUE 290



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Name of taxpayer	Today's date
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Please let us know if you would like to hear from us:

☐ by phone ☐ by email

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